



MONTHLY

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JUNE 1987

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FOR ALL SINCLAIR USERS

They Came From Within!

BUGS IN THE ROOM

The true story of the Spectrum's built-in faults

MULTI-SCROLL UTILITY

**JOHN RITMAN
INTERVIEWED**

**128 MACHINE
CODE**

**MINSTER
HITS!**

**HEAD OVER HEELS
ENDURO RACER**

WIN!

**HEWSON'S
GUNRUNNER
CODEMASTERS
GAME PACK**



"Addictive and compelling - you just can't put your joystick down."

TAITO
COIN-OP

TAITO
COIN-OP

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comes the last word in planet combat...

Multi screen,
realistic graphics
and all the coin-op
features.

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COMMODORE

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SPECTRUM

AMSTRAD

the name
of the game

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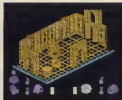
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Apocalypse when?

Apocalypse, the best computer ever produced for the Spectrum is about to make a comeback. The game has lost a bit of its sheen over time, originally programmed by Bob White, recruited by someone or other from their book business, then bought out by someone else, it was due to resurface on the Commodore Software label, which is a subsidiary of French software publishers.

The public libraries also have programs for children, mostly aimed at reading and learning. The city has a public library of 10 branches, and a large library in the center, at Avenida de la Libertad, at which point the main entrance to the north of the city is located. The library has a large collection of books, including fiction, at which point the main entrance to the north of the city is located. The library has a large collection of books, including fiction, at which point the main entrance to the north of the city is located.

**Thrills and
spells!**

[illegible]

And now you continue up the list of the old program General Location from where Software designed for these version right point. The program designed for up to 300 players into your guest the experience of the general location and then tells you and the other 299 players who made the best choice.

Apert from the fact that the result of the election seems to foregone conclusion (you can download various software on www.irs.gov), it seems important



Murder on the Atlantic

Integrates are heading into Agatha Christie territory with their most sophisticated release: *Murder in the Atlantic*, set for release on DVD October 18. The DVD's where a thriller that just has a somewhat...fascinating plot.

Wanda's Point restaurant provides a safe place where the unemployed can find a means of survival. The restaurant's previous owners, Yoon Choi and the Sydney After Hours on the Atlantic, will cost \$42,000. (Photo courtesy of Yoon Choi)



The Thing behind the Mask

Greenleafs need two games: one thing Business Book and MAGE focuses on the complexity of the same game. Thing is actually bouncing on to the spectrum for the first time as the original thing game which involves in the form of the game in which the game is, which the game is.

Excessive consumption of spring is an attempt to beat on post-productive, big history. In addition, there is a risk of falling through time and space to reach for your companions who have been scattered by the full organization. NIMROD from games should be the only one to be used.



Micro-Source

last year we received a small nonreturnable on collect the Minox Source. Originally produced by Curvet this combined Roliflex/Leica development tool was taken over by David House but supplied apparently never made it into the shops. The Minox Source has now been

taken up again this time by Simmons. Electronic (800-444-4444) aimed at the more serious programmer, it got a good review the last time around and passed an EPA test in pool water. Contact Simmons Electronics for more information.

Big Bang

FBI was releasing a compilation tape containing those of the titles in that program's system. The collection, called

Germany I will include Battle of Britain, Western Europe, and Potsdam 1945 and it also has a bonus volume entitled 1939-1945.

Pattern generator

I really couldn't resist this colourful and hypnotic program from Mr D Macdon of Glasgow. The only way to use it is program line this is to enter it and experiment. It's fascinating. By entering the following code in BASIC 1, H, ROM 4, SIMULATOR H, INK 3, STEP 2, SLOD 4, CLAY 7

```
1 FOR A=0/0000 TO 0/0000 READ
  2: POKE 7,0: WAIT 1
  3: POKE 8,0: POKE 9,0: POKE 10,0
  4: POKE 11,0: POKE 12,0: POKE 13,0
  5: POKE 14,0: POKE 15,0: POKE 16,0
  6: POKE 17,0: POKE 18,0: POKE 19,0
  7: POKE 20,0: POKE 21,0: POKE 22,0
  8: POKE 23,0: POKE 24,0: POKE 25,0
  9: POKE 26,0: POKE 27,0: POKE 28,0
  10: POKE 29,0: POKE 30,0: POKE 31,0
  11: POKE 32,0: POKE 33,0: POKE 34,0
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  14: POKE 41,0: POKE 42,0: POKE 43,0
  15: POKE 44,0: POKE 45,0: POKE 46,0
  16: POKE 47,0: POKE 48,0: POKE 49,0
  17: POKE 50,0: POKE 51,0: POKE 52,0
  18: POKE 53,0: POKE 54,0: POKE 55,0
  19: POKE 56,0: POKE 57,0: POKE 58,0
  20: POKE 59,0: POKE 60,0: POKE 61,0
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  284: POKE 851,0: POKE 852,0: POKE 853,0
  285: POKE 854,0: POKE 855,0: POKE 856,0
  286: POKE 857,0: POKE 858,0: POKE 859,0
  287: POKE 860,0: POKE 861,0: POKE 862,0
  288: POKE 863,0: POKE 864,0: POKE 865,0
  289: POKE 866,0: POKE 867,0: POKE 868,0
  290: POKE 869,0: POKE 870,0: POKE 871,0
  291: POKE 872,0: POKE 873,0: POKE 874,0
  292: POKE 875,0: POKE 876,0: POKE 877,0
  293: POKE 878,0: POKE 879,0: POKE 880,0
  294: POKE 881,0: POKE 882,0: POKE 883,0
  295: POKE 884,0: POKE 885,0: POKE 886,0
  296: POKE 887,0: POKE 888,0: POKE 889,0
  297: POKE 890,0: POKE 891,0: POKE 892,0
  298: POKE 893,0: POKE 894,0: POKE 895,0
  299: POKE 896,0: POKE 897,0: POKE 898,0
  300: POKE 899,0: POKE 900,0: POKE 901,0
  301: POKE 902,0: POKE 903,0: POKE 904,0
  302: POKE 905,0: POKE 906,0: POKE 907,0
  303: POKE 908,0: POKE 909,0: POKE 910,0
  304: POKE 911,0: POKE 912,0: POKE 913,0
  305: POKE 914,0: POKE 915,0: POKE 916,0
  306: POKE 917,0: POKE 918,0: POKE 919,0
  307: POKE 920,0: POKE 921,0: POKE 922,0
  308: POKE 923,0: POKE 924,0: POKE 925,0
  309: POKE 926,0: POKE 927,0: POKE 928,0
  310: POKE 929,0: POKE 930,0: POKE 931,0
  311: POKE 932,0: POKE 933,0: POKE 934,0
  312: POKE 935,0: POKE 936,0: POKE 937,0
  313: POKE 938,0: POKE 939,0: POKE 940,0
  314: POKE 941,0: POKE 942,0: POKE 943,0
  315: POKE 944,0: POKE 945,0: POKE 946,0
  316: POKE 947,0: POKE 948,0: POKE 949,0
  317: POKE 950,0: POKE 951,0: POKE 952,0
  318: POKE 953,0: POKE 954,0: POKE 955,0
  319: POKE 956,0: POKE 957,0: POKE 958,0
  320: POKE 959,0: POKE 960,0: POKE 961,0
  321: POKE 962,0: POKE 963,0: POKE 964,0
  322: POKE 965,0: POKE 966,0: POKE 967,0
  323: POKE 968,0: POKE 969,0: POKE 970,0
  324: POKE 971,0: POKE 972,0: POKE 973,0
  325: POKE 974,0: POKE 975,0: POKE 976,0
  326: POKE 977,0: POKE 978,0: POKE 979,0
  327: POKE 980,0: POKE 981,0: POKE 982,0
  328: POKE 983,0: POKE 984,0: POKE 985,0
  329: POKE 986,0: POKE 987,0: POKE 988,0
  330: POKE 989,0: POKE 990,0: POKE 991,0
  331: POKE 992,0: POKE 993,0: POKE 994,0
  332: POKE 995,0: POKE 996,0: POKE 997,0
  333: POKE 998,0: POKE 999,0: POKE 1000,0
  334: POKE 1001,0: POKE 1002,0: POKE 1003,0
  335: POKE 1004,0: POKE 1005,0: POKE 1006,0
  336: POKE 1007,0: POKE 1008,0: POKE 1009,0
  337: POKE 1010,0: POKE 1011,0: POKE 1012,0
  338: POKE 1013,0: POKE 1014,0: POKE 1015,0
  339: POKE 1016,0: POKE 1017,0: POKE 1018,0
  340: POKE 1019,0: POKE 1020,0: POKE 1021,0
  341: POKE 1022,0: POKE 1023,0: POKE 1024,0
  342: POKE 1025,0: POKE 1026,0: POKE 1027,0
  343: POKE 1028,0: POKE 1029,0: POKE 1030,0
  344: POKE 1031,0: POKE 1032,0: POKE 1033,0
  345: POKE 1034,0: POKE 1035,0: POKE 1036,0
  346: POKE 1037,0: POKE 1038,0: POKE 1039,0
  347: POKE 1040,0: POKE 1041,0: POKE 1042,0
  348: POKE 1043,0: POKE 1044,0: POKE 1045,0
  349: POKE 1046,0: POKE 1047,0: POKE 1048,0
  350: POKE 1049,0: POKE 1050,0: POKE 1051,0
  351: POKE 1052,0: POKE 1053,0: POKE 1054,0
  352: POKE 1055,0: POKE 1056,0: POKE 1057,0
  353: POKE 1058,0: POKE 1059,0: POKE 1060,0
  354: POKE 1061,0: POKE 1062,0: POKE 1063,0
  355: POKE 1064,0: POKE 1065,0: POKE 1066,0
  356: POKE 1067,0: POKE 1068,0: POKE 1069,0
  357: POKE 1070,0: POKE 1071,0: POKE 1072,0
  358: POKE 1073,0: POKE 1074,0: POKE 1075,0
  359: POKE 1076,0: POKE 1077,0: POKE 1078,0
  360: POKE 1079,0: POKE 1080,0: POKE 1081,0
  361: POKE 1082,0: POKE 1083,0: POKE 1084,0
  362: POKE 1085,0: POKE 1086,0: POKE 1087,0
  363: POKE 1088,0: POKE 1089,0: POKE 1090,0
  364: POKE 1091,0: POKE 1092,0: POKE 1093,0
  365: POKE 1094,0: POKE 1095,0: POKE 1096,0
  366: POKE 1097,0: POKE 1098,0: POKE 1099,0
  367: POKE 1100,0: POKE 1101,0: POKE 1102,0
  368: POKE 1103,0: POKE 1104,0: POKE 1105,0
  369: POKE 1106,0: POKE 1107,0: POKE 1108,0
  370: POKE 1109,0: POKE 1110,0: POKE 1111,0
  371: POKE 1112,0: POKE 1113,0: POKE 1114,0
  372: POKE 1115,0: POKE 1116,0: POKE 1117,0
  373: POKE 1118,0: POKE 1119,0: POKE 1120,0
  
```

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the highways following the trail of
bounced left for you to feed on (a
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way round the comically tricky
landscape and out of the perilous
rivers and further ruffling, top
dazzling all along. What deadly
plans has the speedy Wile E. Coyote
got in store for you as he takes in
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obstacles before you with
man, agility and grace and a
few "Wile E. Coyote" (Overcome
them all with the golden rule of
speed, the reflexes of a bird and
the speed of the Road Runner
and two legs, otherwise it's
game over and "Wile E. Coyote".

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There are 25 copies of Hewson's latest game to be won

Gunrunner is a sophisticated shoot'em up set on a planet in the grip of an alien invasion. Your task is guide *Gunrunner* over a system of plutonium pipes to collect the plutonium which will enable the perimeters of the planet to see off the invaders.

In your path are wave upon wave of potentially lethal hardware which obliterates *Gunrunner* on impact. There are ten levels of action in a game that will test your reflexes to the limit.

We are offering 25 prizes of copies of the game and *Gunrunner* posters to the winners of this month's competition.

How to enter

All you have to do is ring the eight words hidden in the word square. The words can be either horizontal, vertical or diagonal. The words all have some connection with space. When you're done that just fill in the rest of the coupon.

Send your entries to: Gunrunner Competition, ZX Computing Monthly, No 1 Golden Square, London W1R 3AL.

The Competition is open to all ZX readers except employees of Argus Specialist Publications, Chase Media and Hewson.

The editor's decision is final and no correspondence can be entered into.

The closing date is 10th July 1987.

L	L	A	B	Y	C	M	T	V	Y
X	I	M	V	K	Y	O	O	N	T
T	K	E	L	X	S	V	M	O	L
S	A	T	E	L	L	I	T	E	N
N	O	E	V	S	U	N	O	O	T
S	K	O	T	T	M	V	K	Y	G
L	X	R	G	A	S	N	R	S	E
A	S	T	E	R	O	I	O	R	D
G	R	L	A	C	K	H	O	L	E
I	L	O	M	B	O	V	S	I	N

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Name

Address

Cut out this coupon and send to Gunrunner Competition, ZX Computing Monthly, No 1 Golden Square, London W1R 3AL.

PROJECT

Some of the many solutions to the second problem we posed.

They poured in from all over the place, long short complex and simple. I tested myself away for a couple of days and went through them all.

The solutions I am featuring are not chosen as necessarily being the best, but those which demonstrate as wide a range of methods as possible.



Chris O'Brien used a method where the card data is stored in a flat file. SIM and then REXX of information of my DMS days. It may be better to attend line 10 as that the variable "table" is set up by PERM 23430-254-7000 23430-254-7000 to allow for such peripheral as the interface 1 and monochrome which will offer that address.

There is also a chance that playing cards using a simple AND function will cause some misstatements, such as a diamond GOALS while waiting for a response returns a more efficient explanation. Chris kept the display to a minimum but enough to show that the routines are effective.

```
1 234 23430-254-7000 23430-254-7000
2 234 23430-254-7000 23430-254-7000
3 234 23430-254-7000 23430-254-7000
4 234 23430-254-7000 23430-254-7000
5 234 23430-254-7000 23430-254-7000
6 234 23430-254-7000 23430-254-7000
7 234 23430-254-7000 23430-254-7000
8 234 23430-254-7000 23430-254-7000
9 234 23430-254-7000 23430-254-7000
10 234 23430-254-7000 23430-254-7000
11 234 23430-254-7000 23430-254-7000
12 234 23430-254-7000 23430-254-7000
13 234 23430-254-7000 23430-254-7000
14 234 23430-254-7000 23430-254-7000
15 234 23430-254-7000 23430-254-7000
16 234 23430-254-7000 23430-254-7000
17 234 23430-254-7000 23430-254-7000
18 234 23430-254-7000 23430-254-7000
19 234 23430-254-7000 23430-254-7000
20 234 23430-254-7000 23430-254-7000
```



```
1 234 23430-254-7000 23430-254-7000
2 234 23430-254-7000 23430-254-7000
3 234 23430-254-7000 23430-254-7000
4 234 23430-254-7000 23430-254-7000
5 234 23430-254-7000 23430-254-7000
6 234 23430-254-7000 23430-254-7000
7 234 23430-254-7000 23430-254-7000
8 234 23430-254-7000 23430-254-7000
9 234 23430-254-7000 23430-254-7000
10 234 23430-254-7000 23430-254-7000
11 234 23430-254-7000 23430-254-7000
12 234 23430-254-7000 23430-254-7000
13 234 23430-254-7000 23430-254-7000
14 234 23430-254-7000 23430-254-7000
15 234 23430-254-7000 23430-254-7000
16 234 23430-254-7000 23430-254-7000
17 234 23430-254-7000 23430-254-7000
18 234 23430-254-7000 23430-254-7000
19 234 23430-254-7000 23430-254-7000
20 234 23430-254-7000 23430-254-7000
```

Don Henry sent us two routines in which the display address was used the one which did the job. He kept track of which cards had been previously used by using the array 00 to 26 once selected.

```
1 234 23430-254-7000 23430-254-7000
2 234 23430-254-7000 23430-254-7000
3 234 23430-254-7000 23430-254-7000
4 234 23430-254-7000 23430-254-7000
5 234 23430-254-7000 23430-254-7000
6 234 23430-254-7000 23430-254-7000
7 234 23430-254-7000 23430-254-7000
8 234 23430-254-7000 23430-254-7000
9 234 23430-254-7000 23430-254-7000
10 234 23430-254-7000 23430-254-7000
11 234 23430-254-7000 23430-254-7000
12 234 23430-254-7000 23430-254-7000
13 234 23430-254-7000 23430-254-7000
14 234 23430-254-7000 23430-254-7000
15 234 23430-254-7000 23430-254-7000
16 234 23430-254-7000 23430-254-7000
17 234 23430-254-7000 23430-254-7000
18 234 23430-254-7000 23430-254-7000
19 234 23430-254-7000 23430-254-7000
20 234 23430-254-7000 23430-254-7000
```


EXPERT SYSTEMS

Part 5: Question time.

BY DAVID HOWARTH

What would be your reaction if you went to your doctor with something which seemed like flu, and he asked if you had an inguinal hernia? Even if you didn't know much about medicine, the question is obviously rather irrelevant, and (to answer my question) you'd wonder whether your doctor really knew anything about medicine.

Asking an obviously irrelevant is just one way an expert can lose credibility. And the person consulting the expert must have confidence in the expert if he is to believe the advice the expert has to offer.

So far in this series I have indicated that a computer expert system should adopt a parallel approach to decision making to obtain the most reliable responses. In other words (if you haven't been following the series) all questions necessary to form a decision must be asked prior to making any judgement. With a very small (and, so not very practical)

knowledge base, most questions asked should be reasonably relevant. After all, it is difficult to go off track with only a handful of outcomes to choose from.

But, any expert system worthy of continued use should contain a relatively large amount of knowledge. Under these circumstances, a fully parallel approach would need to ask a vast amount of questions, many totally irrelevant to the problem in hand.

So, to create an expert system of any magnitude which can generate some intelligence (without getting into self-referring questions which are relevant to the problem, other approaches are necessary. And given that a serial approach can be unreliable (one error in response by the user, and the expert will be wrong), what can be done? It's easy to supply a few answers to that dilemma, using some common sense, some probability theory and a different decision making strategy.

Common sense

In trying to solve most problems it is quite often necessary to ask

some broad questions to identify in roughly which area the problem exists, or where the solution can be found. This established, the questions can then be quite specific to pinpoint the problem, and supply a solution. This breaks the problem of asking questions down to two (or more) parts, getting the right ones sorted out, then focusing in on the problem in one or more steps.

In an earlier part of the series, I gave an example of an expert system which advised on computer selection. One fundamental question was whether the user wanted a computer for 'casual' home use, or whether he was a business user. If you assume that the user knows the answer to that, with complete confidence, then an expert system could initially use a serial approach — a question such as 'Will you use a computer for business only?' would separate business from home computer users. Having made that distinction, then one set of questions can be applied to a business user and a quite different set for the home computer user either one using a parallel approach in coming to the final decision.

Table 1. Basic variables, and IFPS structures, in the Node Expert System Designer

of Node Definition

```
and: Play the name of a question (as already been asked,
and, if so, the response truth.
or: Answer true to ask.
not: The total number of nodes.
and: Array holding the question strings.
and: Array holding the response statements.
type: The type of node (linear, parallel).
is: The title of the system.
```

of Arrangement of Node statements

1) Linear (Serial) — System Information

```
Title of the system
Number of nodes
Number of questions
Number of answers
```

2) Linear (Serial) — Node Information

Information on node's status as linear (statement)
The serial nodes, the order of data is as follows:

```
Node type (statement)
The number of questions (not)
The: for each question in form
the question number (position in serial)
where to go on another node
(sequential question, question node, sequential or
sequential or sequential)
sequential question number or the
sequential question number or the
```

For parallel nodes

```
Node type (parallel)
The number of questions (not)
The question number (position in serial) or the question
The number of statements (not)
The Node type for each question in form
(sequential question, sequential node, sequential or
sequential or sequential)
```





What you have in this case is a mixture of parallel and serial decision making. In effect, you have two quite separate expert systems using a parallel approach. Which expert system is used depends upon the response to one question, and a serial decision making process is used to select the appropriate parallel expert system. In this way, the "gate" function just need not answer irrelevant questions about interests in, say, machine tools, and the home user about speedboats.

Nodes

This is a simple example of breaking up an expert system into smaller decision making units. In this example, the full

node (each decision making is called a node), in the serial process to discriminate between home and business user, this case, there are two nodes, both parallel, and both quite independent [i.e. the outcome of one has no influence on the outcome of the other]. Fig. 1 shows this simple system in diagram form. Node 4 leads to node 3 if the user of the expert system says he is a business user, or node 5 if he is a home computer user. Nodes 2 and 3 can then be quite independent parallel decision making expert systems specialising in business and home systems respectively. The outcome from either node 2 or 3 is a response forwarded from the expert system.

By dividing up the expert

system in this way, we have prevented the system asking a lot of irrelevant questions, but it still has a fair few. Very few questions assume that the user knows whether he can be classified as a business user or a home computer enthusiast. And maybe he has interests in both areas.

So, a better solution might be to have node 1 as a small parallel sub-system, asking some "preliminary" questions which allow the user to be classified as business or non-business, or something between the two. Node 1 could then have three outcomes, business, home, and mixed use, each outcome leading to a separate node.

As you will see, applications of expert system using a node

Fig. 1. A multi-headed expert system (cont.)

```

100 REMARK Multi-head expert system
20 REMARK by David Matthews
30 REMARK March, 1983
40 REMARK
50 REMARK Initialisation
60 REMARK
70 REMARK the REMARK number of system
80 REMARK system REMARK Number of nodes
90 REMARK to REMARK Number of questions
100 REMARK to REMARK Number of results
110 REMARK REMARK REMARK REMARK
120 REMARK REMARK REMARK REMARK
130 REMARK REMARK REMARK REMARK
140 REMARK REMARK REMARK REMARK
150 REMARK REMARK REMARK REMARK
160 REMARK REMARK REMARK REMARK
170 REMARK REMARK REMARK REMARK
180 REMARK REMARK REMARK REMARK
190 REMARK REMARK REMARK REMARK
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210 REMARK REMARK REMARK REMARK
220 REMARK REMARK REMARK REMARK
230 REMARK REMARK REMARK REMARK
240 REMARK REMARK REMARK REMARK
250 REMARK REMARK REMARK REMARK
260 REMARK REMARK REMARK REMARK
270 REMARK REMARK REMARK REMARK
280 REMARK REMARK REMARK REMARK
290 REMARK REMARK REMARK REMARK
300 REMARK REMARK REMARK REMARK
310 REMARK REMARK REMARK REMARK
320 REMARK REMARK REMARK REMARK
330 REMARK REMARK REMARK REMARK
340 REMARK REMARK REMARK REMARK
350 REMARK REMARK REMARK REMARK
360 REMARK REMARK REMARK REMARK
370 REMARK REMARK REMARK REMARK
380 REMARK REMARK REMARK REMARK
390 REMARK REMARK REMARK REMARK
400 REMARK REMARK REMARK REMARK
410 REMARK REMARK REMARK REMARK
420 REMARK REMARK REMARK REMARK
430 REMARK REMARK REMARK REMARK
440 REMARK REMARK REMARK REMARK
450 REMARK REMARK REMARK REMARK
460 REMARK REMARK REMARK REMARK
470 REMARK REMARK REMARK REMARK
480 REMARK REMARK REMARK REMARK
490 REMARK REMARK REMARK REMARK
500 REMARK REMARK REMARK REMARK
510 REMARK REMARK REMARK REMARK
520 REMARK REMARK REMARK REMARK
530 REMARK REMARK REMARK REMARK
540 REMARK REMARK REMARK REMARK
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570 REMARK REMARK REMARK REMARK
580 REMARK REMARK REMARK REMARK
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690 REMARK REMARK REMARK REMARK
700 REMARK REMARK REMARK REMARK
710 REMARK REMARK REMARK REMARK
720 REMARK REMARK REMARK REMARK
730 REMARK REMARK REMARK REMARK
740 REMARK REMARK REMARK REMARK
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760 REMARK REMARK REMARK REMARK
770 REMARK REMARK REMARK REMARK
780 REMARK REMARK REMARK REMARK
790 REMARK REMARK REMARK REMARK
800 REMARK REMARK REMARK REMARK
810 REMARK REMARK REMARK REMARK
820 REMARK REMARK REMARK REMARK
830 REMARK REMARK REMARK REMARK
840 REMARK REMARK REMARK REMARK
850 REMARK REMARK REMARK REMARK
860 REMARK REMARK REMARK REMARK
870 REMARK REMARK REMARK REMARK
880 REMARK REMARK REMARK REMARK
890 REMARK REMARK REMARK REMARK
900 REMARK REMARK REMARK REMARK
910 REMARK REMARK REMARK REMARK
920 REMARK REMARK REMARK REMARK
930 REMARK REMARK REMARK REMARK
940 REMARK REMARK REMARK REMARK
950 REMARK REMARK REMARK REMARK
960 REMARK REMARK REMARK REMARK
970 REMARK REMARK REMARK REMARK
980 REMARK REMARK REMARK REMARK
990 REMARK REMARK REMARK REMARK

```




give your answer.

Of course, if the answer to your question points you away from your original theory, then you have to pick the next most likely candidate. That will be chosen on the basis of the original thinking of the user, and the user response. Therefore, your new line of questioning will be aimed at proving that your new target is the driver which is required.

To build this approach into an expert system, you, as the expert and knowledge engineer, have to provide the initial probabilities at any interaction is received. The example in Fig. 4 is a simple way of doing this.

As before, the listing in Fig. 4 will work on both Spectrum and QL. On the QL, the 'x' in line 1000 should be 10, and line 500 can be deleted to give a more tidy screen display. When you run this program, arrays q(0), a(0) are set up to hold the question and outcome steps. The initial probabilities of the four outcomes go into array p (0). The data for this array is held in line 1000, and reflects the relative probability of seeing an aeroplane, glider, helicopter, or balloon in the air above my house. You may want to change these to reflect your regional bias. Array q(0) holds the factors by which each probability is altered should a 'yes' or 'no' answer be given for any question. With the deliberately small system chosen, this knowledge base is also quite small, but you can imagine how the complexity of this could increase with size of system. Array w(0) is a simple indicator to show whether a question has or has not been asked previously.

The important elements of the system are the initial probabilities, and the factors by which they are varied. In the example in Fig. 4, these factors are largely intuitive. For real expert systems, a lot of experience is necessary to get them right. As the new probability is the product of the old probability and the factor, these factors can have quite dramatic effects on the outcome, so use careful judgement in choosing these values if you decide to use the listing in Fig. 4 as a shell for your own system.

EXPERT SYSTEMS

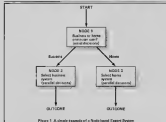


Figure 1. A simple example of a Rule-based Expert System

The listing in Fig. 4 is reasonably well filtered with *Whisker* lines to explain what is going on, it follows the outline strategy given above to decide on whether to go any further, the program compares the probability of the favoured item with the others, if the ratio is greater than 5 (line 700), then it can be assumed that the right answer has been found, and this is printed on the screen.

There is a certain danger in this approach. As a selection of biased questions (as this system does), and if that bias can favour one item enough to give a false answer. It could ignore a question which would rule out the favoured item, or create another favourite. So, again, care is needed with the values given to factors.

Goal

You may not have noticed but, in addition to the use of probabilities, this system differs in a major way from ones which I have presented previously. The earlier systems have been 'data-driven' in other words, questions were asked without too much

'thought' (at least, by the computer) as to the outcome being approached. Both the serial and parallel approach, ask questions in a pre-defined way. With the serial approach, each response is analysed as it is given, using the parallel system of responses are analysed at once. (Other way, the expert system doesn't really know where it is heading until it gets there).

The listing in Fig. 4 is the first example in the series of a 'goal-driven' expert system. Here, the system finds (or is told) the most likely outcome, and selects the questions which can prove (or disprove) this theory. If it is proven to its satisfaction, then it need go no further but if the theory is disproved, then it seeks the next most likely outcome, and biases its questions towards this new theory.

The very simple approach adopted by the example in Fig. 4 can be prone to error. So, in the final part of this series next month, I shall be taking a further look at goal-driven approaches, aiming to remove the possible misleading bits of the system presented this month.

Figure 2. INTERLUDE: OUTCOMES USING PROBABILITIES

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100 REMARKS  Using probabilities
110 REMARKS  ...an expert system
120 REMARKS  A simple example
130 REMARKS  by David Huxford
140 REMARKS  March, 1985
150 REMARKS  Introduction
160 LET count=0:LET answer=""
170 FOR count=0 TO 999:REPEAT:
180 FOR count=0 TO 999:REPEAT:
190 FOR count=0 TO 999:REPEAT:
200 FOR count=0 TO 999:REPEAT:
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5440 FOR count=0 TO 999:REPEAT:
5450 FOR count=0 TO 999:REPEAT:
5460 FOR count=0 TO 999:REPEAT:
5470 FOR count=0 TO 999:REPEAT:
5480 FOR count=0 TO 999:REPEAT:
5490 FOR count=0 TO 999:REPEAT:
5500 FOR count=0 TO 999:REPEAT:
5510 FOR count=0 TO 999:REPEAT:
5520 FOR count=0 TO 999:REPEAT:
5530 FOR count=0 TO 999:REPEAT:
5540 FOR count=0 TO 999:REPEAT:
5550 FOR count=0 TO 999:REPEAT:
5560 FOR count=0 TO 999:REPEAT:
5570 FOR count=0 TO 999:REPEAT:
5580 FOR count=0 TO 999:REPEAT:
5590 FOR count=0 TO 999:REPEAT:
5600 FOR count=0 TO 999:REPEAT:
5610 FOR count=0 TO 999:REPEAT:
5620 FOR count=0 TO 999:REPEAT:
5630 FOR count=0 TO 999:REPEAT:
5640 FOR count=0 TO 999:REPEAT:
5650 FOR count=0 TO 999:REPEAT:
5660 FOR count=0 TO 999:REPEAT:
5670 FOR count=0 TO 999:REPEAT:
5680 FOR count=0 TO 999:REPEAT:
5690 FOR count=0 TO 999:REPEAT:
5700 FOR count=0 TO 999:REPEAT:
5710 FOR count=0 TO 999:REPEAT:
5720 FOR count=0 TO 999:REPEAT:
5730 FOR count=0 TO 999:REPEAT:
5740 FOR count=0 TO 999:REPEAT:
5750 FOR count=0 TO 999:REPEAT:
5760 FOR count=0 TO 999:REPEAT:
5770 FOR count=0 TO 999:REPEAT:
5780 FOR count=0 TO 999:REPEAT:
5790 FOR count=0 TO 999:REPEAT:
5800 FOR count=0 TO 999:REPEAT:
5810 FOR count=0 TO 999:REPEAT:
5820 FOR count=0 TO 999:REPEAT:
5830 FOR count=0 TO 999:REPEAT:
5840 FOR count=0 TO 999:REPEAT:
5850 FOR count=0 TO 999:REPEAT:
5860 FOR count=0 TO 999:REPEAT:
5870 FOR count=0 TO 999:REPEAT:
5880 FOR count=0 TO 999:REPEAT:
5890 FOR count=0 TO 999:REPEAT:
5900 FOR count=0 TO 999:REPEAT:
5910 FOR count=0 TO 999:REPEAT:
5920 FOR count=0 TO 999:REPEAT:
5930 FOR count=0 TO 999:REPEAT:
5940 FOR count=0 TO 999:REPEAT:
5950 FOR count=0 TO 999:REPEAT:
5960 FOR count=0 TO 999:REPEAT:
5970 FOR count=0 TO 999:REPEAT:
5980 FOR count=0 TO 999:REPEAT:
5990 FOR count=0 TO 999:REPEAT:
6000 FOR count=0 TO 999:REPEAT:
6010 FOR count=0 TO 999:REPEAT:
6020 FOR count=0 TO 999:REPEAT:
6030 FOR count=0 TO 999:REPEAT:
6040 FOR count=0 TO 999:REPEAT:
6050 FOR count=
```

EXPERT SYSTEMS

```

400 GO TO 1000
410 RETURN 1000
420 RETURN 1000
430 RETURN 1000
440 RETURN 1000
450 RETURN 1000
460 RETURN 1000
470 RETURN 1000
480 RETURN 1000
490 RETURN 1000
500 RETURN 1000
510 RETURN 1000
520 RETURN 1000
530 RETURN 1000
540 RETURN 1000
550 RETURN 1000
560 RETURN 1000
570 RETURN 1000
580 RETURN 1000
590 RETURN 1000
600 RETURN 1000
610 RETURN 1000
620 RETURN 1000
630 RETURN 1000
640 RETURN 1000
650 RETURN 1000
660 RETURN 1000
670 RETURN 1000
680 RETURN 1000
690 RETURN 1000
700 RETURN 1000
710 RETURN 1000
720 RETURN 1000
730 RETURN 1000
740 RETURN 1000
750 RETURN 1000
760 RETURN 1000
770 RETURN 1000
780 RETURN 1000
790 RETURN 1000
800 RETURN 1000
810 RETURN 1000
820 RETURN 1000
830 RETURN 1000
840 RETURN 1000
850 RETURN 1000
860 RETURN 1000
870 RETURN 1000
880 RETURN 1000
890 RETURN 1000
900 RETURN 1000
910 RETURN 1000
920 RETURN 1000
930 RETURN 1000
940 RETURN 1000
950 RETURN 1000
960 RETURN 1000
970 RETURN 1000
980 RETURN 1000
990 RETURN 1000
1000 RETURN 1000

```

CROSSFIRE

On tape



Why I find it all unproductive pay on the continuing quality of *IX Computing Monthly* down to the very last word. The words, articles and ideas are generally well written and presented (which is more than can be said of many of your competitors). I have learnt much from the programming features which are of great use in building a reference library of useful utilities.

However, one complaint because of the nature of many of the programming items and utilities the listings are often lengthy which leads to errors when entering them and these errors are often more than a few lines in before the next issue or until sometime during the 1000s and 10000s series. There would be excellent possibilities for updates to your, in particular I would like to see *Spreadsheet* and the *Technical Graphics* areas in tape form.

The April issue editor was well done. Despite the error in the *Subjig* I am pleased that you are supporting the tape magazines and have not

abandoned the earlier British concerns and the *IX*. Although there was Page 41 in the April issue I am pleased to see that it is still there in the *IX* and that it is still there in the *IX*.



Thank you for your suggestions. I am glad to hear that all the *IX* readers who write to us have suggestions for our tape series.

Unfortunately the mistake of time has caught up with the *IX* and quality readers to the *IX* is getting more and more. So the *IX* page will appear in the *IX* and the *IX* will appear in the *IX*. The *IX* page will appear in the *IX* and the *IX* will appear in the *IX*. The *IX* page will appear in the *IX* and the *IX* will appear in the *IX*.

Short Cuts



Well done! You are quite right. In *IX* you can find the *IX* in the *IX*. I have now or last been able to see *IX* in the *IX*. I have now or last been able to see *IX* in the *IX*. I have now or last been able to see *IX* in the *IX*.

being using the *IX* 10000 series.

For the record I also converted the *IX* column into a list in the *IX* column (which letter) and use an *IX* column in the *IX* column. I am glad to see that you are using the *IX* column in the *IX* column. I am glad to see that you are using the *IX* column in the *IX* column.

Favourite Utility



For all of it I would like to recommend you to use the *IX* column in the *IX* column.

In answer to *IX* 10000 question *IX* 10000 on which utility would have been used over the years. I would like to say that my favourite utility is *IX* 10000. I have been using it for a very long time and it has been very useful. I have been using it for a very long time and it has been very useful. I have been using it for a very long time and it has been very useful.

BUILD A BETA BASIC

John Wase reviews the upgraded Beta Basic version 4.0

Beta Basic 4.0
Seitron
£15.95

Who says the best, it's a truism to write a review of this program, because, like *Forward*, it has a long and noble line of predecessors, nevertheless, some readers clearly don't use it, or haven't even come across it. So I'll start with a short account of Beta Basic 3.0 for the A&E Spectrum (or the 128 or +2 in A&E mode) and then discuss some of the new 128C program features.

Effectively what Beta Basic does is to enhance Spectrum BASIC by adding many new commands and functions. There are so many I cannot give very much detail but merely select from some recently added commands, novel multiple and memory extra functions which appear as still further keywords, the essential *Enrich* format remains the same, although much has been added. For instance when the computer stops after executing a command, type in the figure sought, and up comes the keyword *END* on the input line (no keyword or the number stops with stop). Add the line number *ENTER*, and there it is, waiting on the bottom line to be edited (over as it is) to be, in fact, reediting, and so on. In addition, the cursor is improved, the editing cursor moves up and down as it ought to, *GOFF* changes the size of the listing screen, you can change either to type in keywords, individual letters, or even a mixture of modes, and *JOIN* and *SPUT* program lines. But I digress. The most important bits for any BASIC programmer are things like the enhanced loops *DO...DOOR* or *WHILE...CONDITION*, *DO UNTIL* condition, *SET IF* structured programming is also enhanced with commands like *IF...THEN*, *DO...ON* to select a line number or statement from a list and *SET FORMAT* which provides automatically indented listings to emphasise structure. But undoubtedly the most elegant

and useful facility is the very full implementation of procedures, following really well structured programs and including the keywords *PROC*, *DEF PROC*, *END PROC*, with *LOCAL*, *SP* parameter, *PARAM* variable value and *END* function. Global and *LOCAL* variables can be used, and parameters can be passed by reference even arrays, so that you need hold only one copy in memory.

There is also an expansion of graphics commands (*GRAPH*, *DEF* a screen area, *POKE* it into memory, *ALTER* various attributes, *DRAW* its *FILE*, *ROLL* and *SCROLL*), graphics of the screen, and *WINDOW*. Beta Basic's improved *SAVE*, *LOAD*, *MERGE* and *VERIFY* all permit use of parts of programs (*SAVE* a library of procedures) and allow simplified syntax for microdrives or discs (*LOAD* 1, "program", or use *DRIVE*).

You can *SAVE*, *MOVE*, or *COPY* part of an array to another array, or *ALTER* its size without data loss. *DELETE* deletes part of an array and *SORT* gives very fast alphabetical or numeric sorting. *NUMBER* and *MEMORY* functions search arrays and strings whilst *LENGTH* gives an array's dimensions and location to check if it sits fit in memory.

Finally a comprehensive set of *tools* commands includes block move, copy or delete, a comprehensive *RENUMBER* command and *ALTER* a search and change command. Those of you who don't know Beta Basic and who actually write BASIC programs carefully if you want to understand what the programs do about what you type if I need really tell the wordprocessing "What's the catch?" The answer is all this lot takes care of a chunk of errors in the A&E Spectrum, although it still leaves about 25% of memory for your BASIC program. How many BASIC programs are larger than that? The catch comes when you want to handle large amounts of data, particularly large arrays. Which is where I come in with Beta Basic 4.0.

Beta 4.0

The last but one Beta Basic Newsletter (January 1987) for details of this article was rather doubtful about the 65 or +2's very restricted memory paging, but has now reformed, mainly because the data handling restrictions I just mentioned, and the ability to handle large

arrays are among the features of the new program which I tested.

The presentation, a pleasant surprise is still 480-type with an input line at the bottom. The full screen editor of the 128C mode is a find, because it has to redraw the whole screen for each command and inevitably loses the last few letters of the next command typed in as there is no input buffer. Beta Basic 4.0, like previous versions, allows keywords to be typed in, in full, so with its improved editing facilities, its display is probably better.

Arrays

Let's start with the serious stuff, arrays. Although the display looks 480, the new keywords are distinctly 1280s. So *DATA* *FREE*, *FREE*, *END* creates a 480 RAM disc. You can then sort it using *SORT* 1, (eg *SORT* 1 *FREE*). *SET* 1 enables you to assign a number or a string to a specific element in the array (eg *SET* 1 *FREE* (20) = "hello") and *PRINT* *MARR* ("FREE", "set") found "set" as *FREE* is about 14000-20000 strings of all length (20) was searched, and about 2200000 strings a position in the array was given. *SET* 1 AND *SET* 1 *END* goes to screen or printer (eg *SET* 1 *FREE*?) *SET* 1 being the most important feature of these new data-handling facilities as it provides the ability to *SET* 1 to any peripheral with direct access to physical channels.

In effect this means you can set up files in RAM which are essentially random access, manipulate them incredibly rapidly whilst still in RAM and dump them out again in message form (microdrive pages say) from random access facilities now and of a speed many a PC owner would envy. The final extra Beta disc command is *INPUT* 1 to *LOAD* a file back from a device to RAM disc (eg *OFFLINE* "C:\BASIC", *INPUT* 1 *OFFLINE*?) which *LOAD*'s back to the RAM disc array. The complete collection of RAM disc commands is *SET* 1 *LOAD* 1, *MERGE* 1 and *DATA* 1 (same as in Spectrum 128 BASIC). *CAN* 1 (how given free disc space remain), (eg *INPUT* 1 and *SET* 1 to move stuff to and from bulk storage, *DIM* 1 to set up a RAM disc array, *MARR* 1 to sort RAM or RAM disc array and *SORT* 1 to sort a RAM disc file.

1. 0.08
 2. 0.05
 3. 0.03
 4. 0.02
 5. 0.01
 6. 0.005
 7. 0.002
 8. 0.001
 9. 0.0005
 10. 0.0002
 11. 0.0001
 12. 0.00005
 13. 0.00002
 14. 0.00001
 15. 0.000005
 16. 0.000002
 17. 0.000001
 18. 0.0000005
 19. 0.0000002
 20. 0.0000001

surface to make the noise with
BOP | the ball carried on
bouncing

All in all, this is a super program if you're an unbelievable number of facilities, and comes as a package containing the 486 Beta Drive 3.0 and the 128K Beta Base 4.0 connected together.

ing is further 30 or so pages for issue 4-6, all tightly packed with information and carefully laid out with illustrative pictures.

The whole comes packed in a stylish wallet from Borg Soft, 92 Oxford Road, Macclesfield, Cheshire, SK10 3QJ. Write to them for details of disc versions and upgrades for existing (checked)

Beta Basic 3.0 was superb, one of the classic programs for the 486 Spectrum. Beta Basic 3.0 is even better, it's solid gold! Get it!

100

Fast emerging as the home musician's supplier, Cheetha venture into a more sophisticated application.

MIDI Interface Cheetha \$49.95

Perhaps the most exciting development in the musical field has been the advent of keyboards and synthesizers which use chip based technology. As this is similar to that used in computers, the possibility of connecting the two has existed for some time now.

In some computing terms the advent of the MIDI standard — Musical Instrument Digital Interface — has meant that for \$100+ you could link your Spectrum to a keyboard equipped with MIDI sockets and perform a variety of control functions such as editing synth sounds or, more generally useful, set up musical sequences.

Up until now a sequence program would either be real time (you play and record live using a tape recorder), or step time (where you enter notes one at a time at the keyboard).

Such programs, because of their specialist applications and limited market, cost a lot. Usually between £25 and £50 each and were aimed at recording studios and music enthusiasts. However such MIDI keyboards have dropped dramatically in price and can be purchased from around £150.

Cheetha have now identified a more general market for MIDI users, and produced their own interface complete with sequencing software for £49.95, by far the cheapest available.

The Interface

This is the usual dead ended plastic case which plugs into the top port of the Spectrum. At the rear are three 5-pin DIN MIDI standard sockets providing IN, OUT and THRU/OUT connections. These are bolted on behind the plastic case and I found that some of my DIN plugs did not have enough reach to plug in the holes in the plastic casing so the plastic covering of the DIN plug to pass. The result is connections which are not very secure. Provided the set up is stable then there is no problem, but if the computer moves then a lead may fall out. This even applies to the supplied DIN lead.

Midi Interface

The through socket also doubles as a synchronization socket for sequences sending 96, 48 or 24 pulses per quarter note via pins 1 and 3.

Considering the price the unit is very good, although the serial notes should be enlarged.

Reading the specifications for the software caused me occasionally. Presented in a minute, eye-opening 16 page instruction manual the program seemed to offer a rather sophisticated range of operations.

The system will allow you to record up to eight tracks of music each track having 16 steps stored in it, each step being from 1 to 64 bars in length. Each track may be assigned to any one of 16 music channels and a song constructed and played on any or all of the eight tracks simultaneously.

Not only that but the music can be entered in real time or step time and edited in step time regardless of which method of entering the music was used.

Each verse can contain a single note sequence or a polyphonic sequence, a very powerful device, and there are ten degrees of quantization or pulse time correction, ranging from note to half note accuracy.

Options

On loading the program after connecting up the interface, the screen offers a microdrive copy to be made. Declining the option presents you with a full 22 lines of options including: Record a verse, back and verse to record, Adjust a verse length, List, test, or copy one verse, Delete a verse, Reverse a verse and many more.

Selection of an option is by moving a bar up and down the screen and pressing Enter. This often leads to a sub-menu where parameters or further options can be selected also using the cursor keys.

In use

I spent a while with it using the Cheetha MIDI keyboard as an input source and a Casio CT01 synth as the sound source connected to the MIDI out. The interface itself does not produce any sound.

It is impressive and I enjoyed working with it. Some respectable music was created fairly quickly and every "I bet I can't do..." thought that occurred to me was proven

wrong. I couldn't think of anything that I couldn't do!

There are however a couple of minor shortcomings. First, it does not automatically turn off all notes when you stop from the sequence play option and all too often the synth continued to play a note indefinitely after leaving that option. The only recourse was to turn off the synth. If you have several keyboards set up with specific control features then this could be rather irritating and time consuming.

Although the playing range is eleven octaves only the five from 4 to 7 is actually operated with my synth, lower and higher notes being played at the highest octave it was capable of. I suspect within a few limits this will apply to many keyboards apart from the full-sized piano simulators.

When in step-time or edit mode the music is displayed in piano notation, bar lines which vary in length depending on how long the notes are. These are displayed one octave of a time and are positioned vertically. Lines are defined by double vertical lines split by single lines depending on the time signature. Horizontal and vertical editing controls allow you to select the note you wish to modify.

Conclusion

For home and general use the interface is brilliant, well worth the money and it extends the use of any MIDI equipped instrument fantastically to the enthusiastic amateur or for semi-pro applications. It is excellent value.

Although the MIDI codes are standardized, unfortunately the MIDI interface path which makes the connection to the computer are not. So for easy interface I've tried using a different combination for Status, Send and receive, to my disappointment this interface is no exception. You cannot use 3.5" or 5.25" 1601 software with the Cheetha interface. A pity as it would have made the unit more viable.

It is compatible with the ZX Interface 1 and microdrives and I believe the Discovery Disk drive.

All Cheetha now to do are in trying out a good independent sound generator on the lines of the TX7 or T804 for under £100 and a complete studio set up will be available at a reasonable price.

Bonabanner & Utility 'A'

Ray Elder looks at two unusual programs from Chemon Software.

**Bonabanner
Utility A.
Chemon Software
£3.50 each.**

Chemon Software is a small mail order company who have produced some general purpose programs, mainly in Basic, for separate applications. **UTILITY A** is primarily designed to enhance microdrive handling by providing a "front end" menu system for incorporation into your own

programs. This performs as per spec in that it is a ready built CBI and menu from itself when saved on any microdrive at file 100.

It is fairly versatile and will handle up to eight microdrives. Also supplied is a routine to add to your programs under development to auto save and update the cartidge.

Thrown in for good measure are two other programs. **TIME** Count produces tables of tape counter equivalents for users of more than one cassette player and **Autodraw** is a pretty pointless diversion into kaleidoscope graphics.

All this is moderately useful, especially if you use microdrives and cannot be bothered to get to grips with them and write your own routines. At £3.50 it is worth it if you want something along these lines.

Bonabanner is a half way house between a full blown artist program and producing graphics from Basic. When drawing in Basic it allows you to draw on a third of the screen using the block character and ASCII and then it produces a Basic line of ASCII, PRINT or DATA with it in.

The drawing screen is easy to handle and works well, with positive (and as shown in the Demo) some quite impressive pictures can be produced. Two or three pictures can be combined to form a larger one.

Some possible uses can be to produce loading pictures which appear faster and more imaginatively than a screen, decorate and enhance your own screens or even produce graphics for your own Basic programs.

Each picture uses about 600 bytes and often, by using the supplied compressor, as low as 90 bytes.

Priced at £3.50 it is again good value if you want this sort of program, it does save the task of producing graphics from Basic, but do you need it enough to part with your money I have no doubt that many readers will find it useful.

Chemon Software, Contact Sandy at 650 Leightonhatch Rd, Litchfield, Leicestershire LE16 4SL, or phone Ron on 0533 661541.

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of the *SlideView*®, in which a small map forms a permanent part of the display with text continuously scrolling in a narrow column up the right-hand side of the screen. You really don't offend this sort of thing in *MacG*, don't you? There's a lot to be said for trying out various methods of on-screen presentation. In fact, *Thames* is a contender for various on-screen

Of course we all know that most appearances are the be-all-and-end-all of adventure writing, but there's no doubt that it can help to offset that "been it all before" impression. You just

[illegible][illegible][illegible]

be useful to have an efficient utility which could cater for all likely styles of presentation for a long time. I've tended to take a short-term view, writing printing and scrolling routines specifically for the jobs currently in hand — considering myself that "one of these days" I'd get around to writing a suitable "for-purpose" utility that could be used for all conceivable situations. Well, "one of these days" has arrived at last. "Multi-Scroll" is about to be launched upon an astonished world.

What we want, essentially, is to be able to define a "window" of any size, anywhere on the screen, so that text can be printed to the bottom of the window and scrolled continuously upwards until it disappears at the top of the window. If we could define RGB and ASCII colour for the window independently of the screen colour elsewhere on the screen, then that would be great, and it might also be handy to have a simple method for clearing the window completely. Finally we want to be able to do the actual text printing from BASIC without worrying about whether the individual text lines fit the window. And so we need a suitable word-wrapping routine as well.

Available Services

All these facilities are available with Multi-Scroll, and at your service. Listing 1 is the assembly program — and as always, I strongly recommend that you use the in conjunction with an assembler — but Listing 2 provides a decimal dump of the machine code for those who've not yet seen the light. As you'll see, the code is stored from address 64000 onwards, and it also lists how you'll need a BASIC loader program if you're using the decimal dump.

Machine code color dump.

Listing 2

64000	04	1	254	71	59	0
64001	0	254	144	69	59	20
64002	19	254	58	0	254	71
64003	71	59	4	254	144	69
64004	69	59	0	254	254	254
64005	144	32	254	59	1	254
64006	254	254	59	1	254	0
64007	0	0	0	0	0	7
64008	7	254	40	7	254	54
64009	54	59	40	254	43	0
64010	7	254	24	0	7	254
64011	254	254	59	40	254	43
64012	43	0	0	0	0	7
64013	254	59	40	254	43	0
64014	59	40	0	254	43	0
64015	0	0	0	0	127	227
64016	227	54	0	254	0	0
64017	0	254	254	227	170	227
64018	227	227	1	0	1	0
64019	0	254	0	183	18	224
64020	224	183	74	224	0	0
64021	0	183	224	0	0	254
64022	224	71	70	0	0	0
64023	18	224	224	0	0	1
64024	1	254	0	175	183	18
64025	18	224	224	224	224	0
64026	224	224	0	224	7	7
64027	7	7	1	54	0	254
64028	254	183	74	1	254	0
64029	0	0	0	0	0	0

but if you rifle through some back issues of Z80 you'll find something suitable that you can modify. (Don't forget to CLASH M700 before you can!)

I've annotated the assembler listing in plenty of detail, so I'll confine my remarks here to a general outline of Multi-Scroll, and how to use it. The machine code consists of essentially four separate routines, each of which can be used independently within a BASIC program as required.

1. SCROLL (USE 64000). This scrolls the screen window upwards by one line. There are several ways of loading this, and the method I've adopted here uses a table of screen line addresses to minimise the complications brought about by the Spectrum's eccentricity of the file. You can find a more detailed explanation of the approach in Pete Cassell's article in the March issue.

64030	0	0	1	254	71	170
64031	170	184	240	240	240	7
64032	0	0	183	183	254	257
64033	257	51	7	254	0	0
64034	0	25	54	7	254	58
64035	58	59	254	71	187	58
64036	58	0	254	71	58	11
64037	58	254	135	25	135	53
64038	0	0	7	254	17	53
64039	42	0	25	54	7	254
64040	254	183	50	231	231	440
64041	231	231	23	254	58	54
64042	254	71	187	247	17	254
64043	247	184	58	140	261	0
64044	0	21	0	0	0	1
64045	0	0	0	0	0	0
64046	0	0	0	0	0	0
64047	84	84	80	84	120	84
64048	124	104	84	132	104	224
64049	224	84	0	73	62	73
64050	73	62	73	62	73	144
64051	124	73	154	73	144	73
64052	73	224	73	0	0	73
64053	84	84	84	84	84	84
64054	0	124	84	84	84	272
64055	183	84	234	84	234	10
64056	84	234	84	73	62	62
64057	104	234	84	234	73	234
64058	234	234	184	84	234	144
64059	184	84	234	84	120	144
64060	120	234	84	234	104	144
64061	144	234	84	234	104	144
64062	144	234	84	234	104	144
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64197	144	234	84	234	104	144
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64199	144	234	84	234	104	144
64200	144	234	84	234	104	144



2) SET THE COLOURS. This centres the window with the chosen fill and HARP colours. Note that it doesn't clear the window — if only changes the colours for whatever is already there and for any subsequent printing.

3) CLEAR JUST SCREEN. This performs as many scrolls as there are lines of characters in the window, in other words, everything previously printed in the window will be scrolled upwards and off the top, leaving the window clear.

4) WRAP (USE SCREEN). Regular readers will have encountered similar routines to this in one or two of my previous articles but we require greater flexibility here, and this one represents it. Forget my last word on the topic: its purpose is to print text hard in the BASIC variable 0 in the window, scrolling the lines and word-wrapping (if necessary) — so you don't need to worry about padding your text with spaces to make it fit the window, this routine will sort all that out for you. The only limitation is that LFN is should not exceed 255 (which means that for really long chunks of text, you'll need to break it into separate sections — and also possibly do this anyway to avoid textual disintegration on-screen.)

This, then, is what Multi-Scroll does — but how do we control it

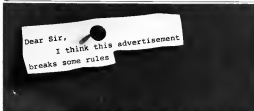
from BASIC? Very simple. There are six addresses whose contents determine the behaviour of the routines, and these should be POKE'd with suitable values before the routines are used. Four control the size and position of the window and two control the colour as follows:

1) The limits of the window are defined using the four addresses from 44026 to 44029 (inclusive) (labels TOP, BOT, LFT, and RGT respectively — see Listing 1). Think in terms of the Spectrum's normal system of identifying character squares, and set the limits accordingly. For example, if you POKE 44026,16; POKE 44028,24 then your window will be three lines high (with line 24 the bottom line to which printing is done). POKE 44027,0; POKE 44029,31 will set the left and right limits so that your window will occupy the whole width of the screen (from character square 0 to character square 31). Incidentally, no check is made for invalid screen positions within the routines, so don't go poking any old numbers in here!

2) The colours (from 0 to 7 inclusive, as usual) are defined using addresses 44029 and 44030 (BKG and HARP respectively). Again, no check is made for invalid colours.

Other uses

Although the most obvious use for Multi-Scroll is in a graphic adventure game, with text scrolling continuously (even on illustration of some kind, there's nothing to stop you from using it in other contexts, perhaps with several windows on screen at once, by setting up a small number of BASIC subroutines to define them. To show how this can be done, and to illustrate all the things we've been talking about, I've given in Listing 3 a short demonstration program which will put Multi-Scroll through its paces for you. Notice that the various LFN call and POKE addresses are allocated to suitably named variables in lines 30 to 50. This makes for improved readability, and saves you looking up the numbers each time. Save the demonstration program to quaternary tape like I — if you're working from tape rather than magnetic, you'll need to change the LOAD instruction in line 10 and save the machine code block immediately after the BASIC. If you follow what's happening on screen, comparing it carefully with the listing, you should rapidly get the hang of things. Have fun.



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GAMES



KRAKOUT

System
CPM

This is another Breakout variant following soon after Ozark's Asteroid used to breathe new life into this old formula. Asteroid succeeded but unfortunately the game cannot be sold at Krakout whose new additions have left it devoid of the appeal of the original game.

Like Asteroid there's a poor attempt at a plot in this case you are trying to "out manoeuvre the computer agent". Of course to accomplish this you must blast your way through wall upon wall of bricks.

In addition to the game being expanded too far, you lose before the ball hits to your ball machine, bombs, extra lives etc. These are explained if you succeed in hitting the right blocks but as you have

little control over which block you hit once the ball is on it was in all fairly ordinary Asteroid. The scrolling method was nothing fancy, capsules which added to the complexity of the game.

Another change is that Krakout is played horizontally across the screen rather than the familiar vertical play of Breakout. I still really see my colleague in this change. In fact it seems to detract from the gameplay.

On the plus side the graphics are very bright, you can vary the speed of the game and there are 160 scores worth of scored blocks to strive for in the final address. I lack an answering additive quality.

GOOD



Presented as an old action arcade game featuring large graphic and scrolling synthesized sound, this is actually three unrelated scenarios of three old games.

The first phase of Sigma 7 is to fly through space to the factory while fighting off the space mines that spawn around you in a series of attack waves. These mines are remarkably similar to alien spacecraft and even fire missiles at you. After surviving a brief asteroid shoot are up you enter a 3-1 looking like Interplanets the latest version of Rastan.

In the factory you must clear the difference by collecting data while being chased by robots. When the game is on you have all parts of the scrolling maze. There can be shot with your laser but your main objective is to end the pattern of data that can be viewed as the game is

completion for large three. The third and final stage is a laser puzzle in which you must enter the pattern onto a control box while avoiding a laser sphere that tries to touch your course and kill one of your lives.

You begin the game with the Robotron three lives but gain another three lives when you complete a stage. You could find this lives by the time you've finished the first level and you'll need them to survive later levels when you have to face more space mines, laser attacks and bigger factory scenarios with a more complicated mode.

The graphics are good and do add a new level of life to these third and fourth game forms but for £7.95 you expect something different.



GOOD



Brannache's story is again that left all his mining equipment in the field mines and now has got to look, and get it, uped on to the top of the mine. Brannache has time for a disclaimer to show them all how clever he really is and decides to drive deeper into the mines and search for the fabled Brannache diamonds.

Although the game features pleasant scrolling backgrounds you are likely to be in a frustrated game, the game itself is full of

One here is little more than a side man that endures looks into the background to do all the flying, crawling and plant-like noises that are out to get you. Hidden in the ground are the plants and traps that you can walk on and plummet off at the screen left and right as it is attempt to avoid. Forget Brannache, this is just a plot.



GRIM







COMPETITION

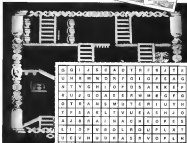


After ploughing our way through all the recent budget software releases we thought it might be a good idea to round up some of the best of them and offer them as prizes in a competition. Imagine our surprise when it turned out that most of the titles we thought of were by Codemasters, so here we are with a special Codemasters competition offering 12 sets of their four latest games, Star Runner, Super Robot, Road, Ghost Hunters and Renegade.

How to Enter

All you have to do to enter the competition is to list the names of those games and two other recent Codemasters' releases in the word square below. Then just fill out the details of your name and address and send it in. All entries must arrive by first post on the 10th July 1987: the competition is open to all residents of the UK except employees of Argus Specialist Publications, Codemasters Software Co and Chase Webb. The editor's decision is final and no correspondence can be entered into.

**Win a set of
Codemasters' budget
hits.**



U	H	E	R	N	D	R	F	G	I	D	P	E	A	G
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Complete this coupon and send it to: Codemasters Competition,
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Closing date is 10th July 1987

COMPETITION

Carol Brooksbank
 reviews the new 128
 version of Artist II, and
 the debugged 48K.

Good news from Softdisk: You may remember that when I last reviewed THE ARTIST II in February I commented on the bugs in the program and said that Softdisk really should take another look at it. Well, I am pleased to report that they have done just that! The 48K version has been re-issued without the bugs, and is now the really splendid program it always promised to be.

It has all the screen-drawing facilities that you would expect — static lines, filled or unfilled shapes, alternative typefaces, freehand drawing, keyboard, joystick or mouse control, enlarged views for detailed work, text and spline designers, numerous and as definable fill patterns, but the three features which lift the program head and shoulders above the opposition are the window option, cut and paste, and the Pagemaker.

The window option places a rectangular window of any size from one character square to the full screen, to be defined. The graphics within it can then be manipulated — turned, inserted, enlarged or reduced, copied to another part of the screen, mirrored, defined or thickened. The window can be scrolled, and attributes reset. But the really exciting feature is the insert facility. A second screen can be loaded into memory, then scrolled around in the window area, until the required section is within the window. The graphics from the second screen are then copied into the current artwork. The window option only offers areas corresponding to the character squares to be manipulated, and movement about the screen is in character square jumps, to cut irregular shapes, or work to pixel accuracy; the cut and paste option is used.

Now you can draw a box circle or irregular shaped line around the exact section you wish to work on, and then move it to the new location, turn, mirror or insert it. It can be AMBID, SCOTED or CLOD into the new position. This option has the same insert facility as the window feature, so that pieces can be cut from a second

RETURN OF THE ARTIST



screen and inserted into the current artwork. The scroll option in cut and paste moves in pixel steps, so that the final placement can be absolutely precise. The illustration of typefaces shows some of the effects available by using these options.

Pagemaker

The third unique feature of Artist II is the most exciting of all. This is the Pagemaker, a page layout facility, which enables you to combine text and graphics and print on A4 paper. The text, which must be produced using THE WRITER word processor, forms the 'skeleton' of the page, which can hold 96 lines by 64 columns of text, or up to eight full screens of graphics. A full screen occupies 24 lines x 32 columns. When the text is being typed, spaces must be left where the graphics are to be inserted. Any size illustration, from 1 character square to a full screen, can be used to the layout must be carefully planned at the word processing stage. There are five type faces

available which are selected by inserting control codes into the text, or by underlining or inserting. The finished text is saved, and then loaded into the Pagemaker.

Pagemaker divides the page into four blocks, each capable of holding two full screens side by side. You can split some the block to read the full width of the page. A graphics screen is loaded into memory, and a window defined on the block where the illustration is to be placed. The graphics are then scrolled to bring the correct portion into the window. When all the illustrations in the topblock are in place, it can be saved and/or printed, and the procedure repeated for each of the other four blocks. The resulting page is very attractive, and beautiful.

If you wanted to print multiple copies of a many paged document, this could all be a bit tedious, especially if you save to tape, because four separate blocks must be loaded and printed one after the other.

Some of the Artist II's typeface effects.





**The Sentinel
Firebird
\$9.95**

**An intriguing and
original release from
Firebird**

In a land far away where pure energy is the only source of power the Sentinel rules supreme. Now you can challenge this master as a battle that will rage over 10,000 landscapes that are amazingly generated into 481.

Each landscape is a world of its own built out of plateau, peaks and pits. On top of the highest peak stands the Sentinel. You begin at the bottom of the descent pit.

The Sentinel from its lofty throne roams rapidly and scans the landscape beneath it for anything with a surplus of energy such as you. The Sentinel absorbs the energy of living things and recycles it into the lowest life form which is a simple control tree that it scatters around the barren landscape. You can absorb

these trees to collect the energy to defeat the Sentinel.

You are in fact a robot that can't move but can duplicate robot shells from energy and transfer to them. You can then absorb the old robot shell thereby reclaiming the energy. Using this method you can move to any plateau you can see below you, and can rise up levels by building boulders on top of plateaus. Then the robot shell on top of that. You can stack boulders to any height (although you can't only see the top of one boulder) and build up to the highest level. However, a boulder costs two units of energy and a robot three which leads to limit your expansion. If you think you're in desperate trouble you can hyper space (costs three units) but you'll end up at a equal height or even lower plateau.

If the Sentinel traps you in its deadly gaze it will gradually absorb your stored energy until you either transfer to another robot, hyperspace or die. If it spots you but can't see the base of the plateau you're standing on it will try to flush you out by converting the nearest tree into a rock. These stones the creatures also rotate and if it

uses you before you can absorb it or get away then it'll take you to hyperspace. This will cost you three units and will probably land you in the gaze of the waiting Sentinel.

By landscape thirteen things are getting a little trickier as the Sentinel has now recruited the help of a Sentry. This is a mini-Sentinel that also stands on a tall peak and absorbs anything caught in its gaze, creates Mines to flush you out and of course guards the Sentinel. In later landscapes the Sentinel acquires more and more Sentinels which must be destroyed before you can locate the Sentinel. By now the landscape is also getting hotter with less cover in which you can hide from the energy draining gaze of the Sentinel and his Sentinels. In one landscape you begin in the centre of a wide open circle surrounded by six peaks containing the Sentinel and eight Sentinels.

The game is a mixture of tactics, strategy collecting and reactions as you escape Mines and the Sentinel. Your first task is to find the Sentinel (the Sentry) before they find you and gauge the direction and speed that it's moving. You can then aim to stay on its blind side while you absorb enough trees for your assault. To absorb the Sentinel and complete the landscape you must get above it by standing on boulders and absorb it by homing in on its laser. One landscape down only 9,999 to go!

You don't actually have to complete every landscape as an completion of one you're given the eight digit code for your next one. The next code you're given depends on the amount of energy you have left once the Sentinel has been defeated. The more energy you have the more landscapes you skip. Soon you will have pages and pages of eight digit codes corresponding to the games landscapes. This means you can start any game of any landscape you like as long as you have the code. It's best to keep all the codes you find as you may get stuck on a particularly tough level that you could beat up by reaching a previous level and gain to finish it with more energy.

The Sentinel is an absorbing mix of genuinely demanding strategy and skill to solve it. Original, addictive and massive, what more could you possibly want?



Throne of Fire

Throne of Fire
Melbourne House
\$7.95



The latest game from the author of Doomsday's Revenge.

■ In between his efforts to complete *Gorm Scapins*, Mike Singleton has managed to find time to design *Throne of Fire* for Melbourne House. However, the design is all that's been done, for the huge credits roll the accompanying graphics and music to *Galactic Computer Systems*. Perhaps this rather piecemeal approach explains why the game doesn't quite seem to know what it wants to be.

The action takes place within the flaming Citadel, home of the King of Cordonia who has just shuffled off this mortal coil, and centred around his three sons, Alon (well meaning but thick), Gordon (the good guy), and Lord (boo, hiss). All three princes want to be the next king but in order to ascend to the now vacant Throne of Fire one brother has to destroy the other two. Which is where you come in.

The game offers one or two-player combinations, with the computer controlling either one or two princes depending upon the number of human players. Each prince begins with a force of nine mercenaries, loyal followers who are under his control, scattered around the Citadel so that you control a

total of ten characters in all. In addition there is a fourth force, the King's Guard, who are neutral until one of the princes gains the Throne, at which point they throw their lot in with him, giving him a military advantage. There is also a number of Gate Rooms, where new mercenaries can enter the game. These new men become loyal to whichever prince's forces control the room, so it's to your advantage to try and secure one or more of these rooms.

Once you've selected your control options, number of players etc, the screen display is divided in half — one half for each prince (while the third just wanders around making a nuisance of himself). The top of each part of the display shows the room that the prince or one of his men occupies, and the lower part is a map of that part of the Citadel with the windows of each room coloured red to indicate which force holds it.

Although you control ten or more characters in all, you can only control one of at a time, so much of the skill in playing the game lies in co-ordinating these characters' actions so that you can explore the castle and secure the best locations.

Control of the game is

divided amongst three modes of action. Select mode allows you to move a cursor around the Citadel map in order to select which of your characters you want to control. Movement mode shows the animated movements of your character from room to room, and combat mode lets you switch a few buttons via joystick or keyboard control. The combat is swordplay, though there are a number of different weapons and magic objects that can be found around the place.

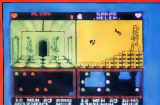
Most games players these days fall into one of two camps, there are the adventure strategists, and the arcade addicts. *Throne of Fire* however, falls rather uneasily between these two camps, the strategic element in the game is nowhere near as challenging or as wide in scope as Mike Singleton's earlier work of *Midnight* series, presumably because of the memory taken up by animated graphics. On the other hand the combat sequences, though quite well animated, simply don't compete with dedicated arcade games.

The game is quite stoddy programmed and enjoyable to play for a while, but I didn't find it all that addictive and getting to five and didn't really seem like a challenge that I wanted to spend much time on.

It might be that *Throne of Fire* was an attempt to combine the strategic complexities of games of *Midnight* with the more visceral thrills of games like *Expanding* but, and where that might be possible on larger machines, I don't think you can pull it off with just 48K to play with.



GREAT





SPECTRUM BUGS | 10000

Toni Baker details some of the Spectrum's 'undocumented features'

Bugs in the ROM

The Spectrum, as you may well know, is a machine of very many bugs. Some of these bugs crop up only in BASIC; some occur only in use of machine code; while others still are manifest all the time. Though the ROM (or rather ROMs, as there is more than one type of Spectrum) cannot be written to, and therefore the bugs cannot in general be cured, knowledge of their existence can certainly help us to avoid them, or get round them in some way.

This article is therefore a compilation of all the bugs that I know of which occur in the 104, and 128 Spectrums, the 128 and 128+2, and also the ZX Interface One which runs the microdrives. Since there are many other Interfaces which can be used in place of Interface One I cannot comment upon all of them; I shall restrict my focus of attention to the Spectrum plus Interface One, since these are factory standard equipment.

It is almost impossible to classify bugs in any sensible manner. What I have done is to group them into fairly large and ambiguous clumps such as 'PRINT errors', 'CALCULATOR errors', and so forth. I personally have discovered only a minority of these bugs (some of which have caused me great frustration in the past), but the remainder are taken from two books, namely *Understanding Your Spectrum* by Dr Ian Logan, and *Master Your ZX Microchine* by Andrew Fennell. Credit is given, wherever all bugs other than those I have discovered meet. Doubtless other people will have made simultaneous discovery of these bugs — this is always the way.

I shall start off with three bugs which I classify fit into any category at all. The first bug is the most serious of all Spectrum bugs, but it is BASIC. This is the CLOSURE bug.

The Closure bug shows *Understanding Your Spectrum* by Month 6. (John Pollard)

The CLOSURE bug is present on all Spectrums which a ZX Interface One is attached. If you attempt to close a stream which has not previously been opened using the BASIC CLOSURE statement then the system will almost inevitably crash. More often than not causing a system reset; the presence of the ZX Interface One cures this bug by transmitting control to its own ROM (the Shadow ROM) whenever the program counter reaches address 1245. The bug is caused by the table in the 48K ROM of address 1245 not being terminated by a 00 byte. It is interesting to note that Sinclair (or Amstrad rather if you would) used this bug if listed in the Spectrum 104 — other old they have made a few other alterations to the ROM — but also they chose to leave the

JOHN POLLARD

bug in place, a surprising decision considering the uselessness of the bug.

The Plot Bug

The BASIC PLOT statement suffers from the fact that it will accept negative coordinates. In fact the statement PLOT X,Y really turns out to mean PLOT ABS(X),ABS(Y). This is caused by a failure to test the G and L registers on return from the CALL SK, TO, BC instruction at address 220C.

The Screen One Bug

The Spectrum 128 offers a choice of two different areas of memory which may be used to hold the television picture. These are called SCREEN 0000 (the normal one, at address 4000h) and SCREEN 01 (the alternative at address 7C000). The instruction PEEK 23556,34 will activate screen one, whereas PEEK 23556,18 will activate screen zero. For more information see the series (also the 128, during this month). The bug occurs in the same circumstances as the screen also area becoming full in which case lines may collide with the screen or it may from 217 lines, however small, one that in which case the catalogue collides with the screen. The bug is caused by the complete failure of the ROM/ASIC system to recognise the existence of screen one. The BASIC program in Figure One will demonstrate this bug visually — it's quite fun to watch too.

PRINT Errors

The CHR\$ 9 error

From Understanding Your Spectrum by Dr Ian Logan, CHR\$ 9 is supposed to print as "forwardspace" (the opposite of backspace). In other words the effect of PRINT CHR\$ 9 is supposed to be that the print position is moved rightward by one character space without altering the contents of the screen. Sadly, this does not work. Not only does the print position

not move at all, but the character at the current print position is automatically recoloured with the current colour. The first of these faults is due to the fact that the correct right subregister of address 0A3D ends with 0F, instead of with 0F 0A0000. 2086, however the second fault is due to sloppy thinking in the system variable BASIC... I should have been assigned with IF and then reformed. Personally I feel that the whole algorithm is up the spout

The CHR\$ 8 error

From Understanding Your Spectrum by Dr Peter Ottmar, CHR\$ 8 prints as "backspace" — that is — when printed it will move the print position leftward by one character space. However — if the current print position is A1 00, then backspace will not work. Furthermore, it is possible to backspace from position A1 00, (which should not be possible) and this can produce some interesting results. The bug is caused by the constant subroutine at address 0A3D testing for line one instead of line zero. The byte of address 0A3D should be 0Fh instead of 0Eh.

The 2705 error

From Understanding Your Spectrum by Tony Bateley, This is a bug which manifests itself in both BASIC and machine code. In BASIC the statement PRINT "BUG"+2705 0.5 will simply print "05". In machine code the bug manifests itself in the PRINT 10 subroutine at address 2055, whose purpose is to print the floating point number at the top of the calculator stack to the current channel. This subroutine is called by the 2705 routine and in this way the bug also appears in BASIC. The bug occurs whenever the number at the top of the calculator stack for the argument of 2705 lies between -1 (and -4) exclusive (including zero). In such a case an erroneous zero is left at the top of the calculator stack, and it is this which causes all the problems. In BASIC the bug can be avoided by using temporary



variables — eg LET A\$=CHR\$ 0.5, PRINT "BUG"+A\$ will work. In machine code I would advise you to use the subroutine listed in Figure Two in place of PRINT 10, as this takes the bug into account.

The Colour Commands error

From Master Your ZX Microdrive, by Andrew Roberts

If any channel other than the screen or the keyboard is selected as the current channel (ie it the last thing PRINTed was to a channel other than "S" or "K") then the permanent colour commands will erroneously overwrite the colour control codes to the last channel used. The bug is caused by the failure to select channel "S" at the start of the subroutine GO_TEMP, at address 2114. It is possible to get round the problem by preceeding each permanent colour command by a PRINT statement (eg PRINT "K" 4).

The Colour Controls error

If one nonstandard channel (eg a user-defined channel) is selected as the current channel then the colour status such as PAPER 4 (etc) will produce an error. Roberts in BASIC if the channel routine returns with the carry flag set (this caused me a few problems



Figure 3.

```

10 POKE 25500,24: REM activate screen one
20 FOR I = 1 TO 562
30 GATRI "Y" + STR$ I :GOS 0,1
40 NEXT I
50 PAUSE 0
60 POKE 25500,16: REM activate screen zero

```

in the Screens and Channels series). This bug is only visible in machine code. To cure the problem it is necessary to ensure that all channel output routines return with the carry reset, or least for control codes 16h to 15h and their second parameter. The **SCREEN** Colour Commands error.

This is for users of 128K machines only. On both the Spectrum 128 and the Plus3 the command **UPRINT** and **A** will produce error report 0. Otherwise in BASIC there are two reasons for this. Firstly, the new channel "P" (the

direct control to the label **DRV_START** instead of **DRV_16h**. This means that numbers may not be correctly rounded up. You can avoid any major problems by using **IF ABS (X-Y) < 3.05e+8** instead of **IF X=Y**.

The **-45534** error (from Understanding Your Spectrum, by Dr Ian Logan.) The ROM is inconsistent about the calculator (event-byte) form of the number **-45534**. Some parts of the ROM assume that only numbers in the range **-45535** to **+45535** may be loaded as

Bugs in the ROM

SCREENS correctly leaving the stack correct. As with the **SCREEN** error the best way to avoid it in BASIC is to use temporary variables, eg **LET ADDRESS=16000**, **IF "X"=A THEN PRINT "END"** will work correctly.

The **MODDIV** error. Calculator code 12h (initiated by **RT 26**) is supposed to remove two items from the calculator stack — **X** and **Y** and replace them by the quotient **X MOD Y**, **DRV Y** in that order. (Note: **X MOD Y** means **X - Y * INT (X/Y)**, whereas **X DIV Y** means **INT (X/Y)**.)

Unfortunately, it fails to take into account the fact that the **INT** subroutine compares calculator memory zero whenever its argument is negative. This means that the quantity **X MOD Y** will be ignored whenever **Y** is negative. The bug could have been cured had Sinclair ensured that the **MODDIV** subroutine of address 36A0 utilized memory one instead of memory zero.

The **STD-FF** error. Calculator code 3C (initiated by **RT 26**) is supposed to multiply the item at the top of the calculator stack by the factor 10 (A. Unfortunately, unlike the **B** register the **A** register is not preceeded by **RT 26**, and so by the time the byte 3C is reached the **A** register will have already been corrupted. The only way out of the problem is to use **error=10:A:GOS 2047** i.e. **RT 26** instead of the byte 3C in your code.

The **INSTR=0** error. Normally string zero represents the null string, so we would expect **INSTR=0** to be similar in operation to **INSTR** without a screen number. This however is not the case, and **INSTR=0** almost invariably produces an empty string, making it completely useless. Note also that calculator code 1A, examples **INSTR=0** (where **X** is the item at the top of the

Figure 4.

RT26	MOV RT, A	Go to the top of calculator stack.
RT27	LD A, RT, 0	Store in register variable.
RT28	GOS 2047, RT, RT, FF	Enter the floating point number.
RT29	LD A, RT, 0	Go to the top of calculator stack.
RT2A	LD RT, 0	Store 0.
B	LD A, B, 0	Go to the top of calculator stack.
RT2B	LD (RT2B), A	Store in (RT2B) to the second value.
RT2C	LD A, RT, 0	Store in register.
RT	RT	Return.

built in **SCREEN** coded) erroneously expects the colour controls to be followed by two parameters instead of just one. And secondly the ROM routine sets the carry flag (local and error driver). Sinclair/Amstrad may like to know that the byte of **SCREEN** (12h) or **SCREEN** (12h+2) should be 0h instead of 25 and further, that the byte of **SCREEN** (12h) or **SCREEN** (12h+2) which currently reads 0CF should be replaced by two bytes **SCFCCF**.

Calculator Errors

The **Division Error** (from Understanding Your Spectrum, by Dr Ian Logan.) The BASIC statement **IF 128 < 0.5 THEN PRINT "END"** is sufficient to show that there is a bug

somewhere in the world. The bug is in the division routine, which fails to register the thirty-fourth bit of a division. The 34 displacement at address 3000h

interprets, whereas other parts of the ROM view an integer form of **-45534** (as opposed to a full floating point form). This bug is dealt with in detail in Dr Logan's book. The Complete Spectrum ROM Disassembly and is demonstrable by the now famous statement **PRINT INT -45534** which gives **-1**.

The **SCREENS** error (from Understanding Your Spectrum, by Stephen Kelly and others.)

The BASIC routine for calculating **SCREEN** accidentally leaves a duplicate entry of the string result at the top of the calculator stack. This means that the BASIC statement **IF "X"=SCREEN(0) THEN PRINT "END"** will invariably print "END" no matter what happens to be on the screen at the time. The bug is fortunately not present in machine code and polling the subroutine **RT_SCREEN** will evaluate

calculator stack and this is
to be taken whenever `store`
X appears in the keyboard. The
bug is in the subroutine of
address 1494 which adds
address X to the current
channel. The `store` 985
SRLG) of address 1494
previously access only one key
and it would otherwise
have been detected. The bug
could have been caused in the
main or subroutine of address
1494, by passing the value of
PLANE. This is the end of
main. `main`

Keywords: child sexual abuse; disclosure; social support

When a user-defined function is evaluated the value of the system variable (`CH_ADD`) which stores the address of the next character to be interpreted, is stored on the machine stack instead of in one of the dynamic variables such as `CC_PTR` during

the evaluation of the function. This means that any user-defined function which causes the BASIC program data to move up or down in memory will cause user space C Monitors in BASIC. This is normally possible, but exceptions exist. For example, the GDF FM algorithm contains the function `USR`, and could also conceivably happen with the function `ENVIRON`. To guard this bug you must ensure that any machine code subroutine which is called by a GDF FM statement does not disturb the BASIC program stack. It is impossible to define a function which `USR` would cause to delete BASIC lines or, if inclusive, affect data manipulating the machine stack.

[illegible]

Machine code programmers will be so familiar with this one that they don't even think of it as a bug any more. The problem is that the HL register, whose value is required by the `LDI` instruction of address `2756h`, is not preserved by the USB subroutine at address `3403`. This means that any machine code subroutine which disturbs the value of HL should contain `2756h` just before the system upon return. To avoid the bug simply insert that `LDI` containing `2756h` upon execution of the final `LDI` statement of any machine code subroutine called by USB.

End of the Road | **Barry**

THEORY **RESEARCH** **APPLICATION**

(from Understanding Your Spectrum by Dr. Ian Rogers.)
Whenever a prompt message such as "loadit" or the cosine messages appear, the Spectrum waits for you to press a key. The problem is that if you press the wrong key, things go wrong. Pressing TRUE VIDEO, IN VIDEO, CAR, LOCK, DISARM, or EX-LOCK

11

FFFF	INTERRUPT	FFFF	Programs the INT register.
FFFFA000		00000000	It's contents value compiled by normal interrupt register.
		FFFF	Resets normal interrupt register.
FFFF		FFFF	Resets IT register.
00		0000	Writes.

MODE causes the previous edit line to appear at the bottom of the screen, with the **HE** flashing cursor (even on IBM machines). This is because the **RTN** INPUT subroutine at address **03A8** is designed to deal with **CAPS LOCK**, mode changing, and colour control parameters; however this is inappropriate for prompt messages.

The Current Use Census in the

From Understanding Your Spectrum, by Paul Harrison? The bug is dependent only on the ISA and 486 processors. IBM PC/XT has the problem because the INT key doesn't do quite the same thing. Use #000 FFFF0000! (note that "F" stands for INTR) and, provided there are no lines greater than 9999, you'll see the problem...is GREATINTRA symbol appears in the egg file. The bug occurs in the CPU_114E routine of address 0000. The bug could have been avoided if the subroutine had refused to print the GREATINTRA count whenever (of four of ELAGES) were set.

[illegible]

More understanding of the spectrum, by Dr. Ian Jager / FLASIS is supposed to be set whenever a leading space is not intended for it.

keyword follow. Unfortunately, the ROLM is not consistent about its use, as the first line becomes:

DATE FOR THE 31 FIRST CLASS
DATE SENT

will prove. The patients would be solved if the tag were to be set every time CLS were recorded, or whenever a control character ID to it were detected.

Figure 1

about understanding your spectrum. (by Chris Truesdell) This is another one for IAX and editing spectrum only. It, when editing program like, the cursor is a floating "I". Then the editor is told to be in K-mode. This means that the next key you press will be interpreted as a keyword, so that if you press "P" for instance, then you'll get **POINT**. The problem is that if you hold a key down so that it repeats then, it mode remains in force. This means that you could end up with a line like **NEXT NEXT** instead of **NEXT M**. The bug is caused by the **K_REPEAT** value of address 033C.

To work properly the routine would have to subtract the A0 from the key value whenever it's less greater than has 15. This would replace keywords with control codes.

[illegible]

ENTRY 77	END	IF (END)_OK	Initiate control to output module.
		END TEST	
75	(END)_OK	FILE #	
76		FILE #	Read tape 4, 5, 6 and FLAG.
7601		LS 4, 5	ST Output interrupt status.
77		FILE #	Read interrupt status.
7701		LS 01, 001	Get port number valid for output.
7702		LS 4, (ADDR_0)	Get control page.
7703		LS 00 00	Initialize "test" tape.
78		IF	Enable interrupts (as now on).
			Interrupt should inform the software (connections).
7900		GO (END)_0, 1	From previous page.
7901		END 10, 1	Locally change test.
81		IF #	IF Output Error interrupt status.
8101		LS 00, (END)_0, 1	Jump IF interrupts previously disabled.
82		IF	Re-enable interrupts.
83	(END)_0, 1	IF #	
84		IF #	Enable 4, 5, 6 and FLAG.
85		END	Change.

The Syntax Check error

(from Master Four ZX Microdrive)
(from Andrew Peters)
On the 128 and 486 Spectrums the four keywords BASIC, MOVIE, FORMAT and GAT have incorrect syntaxes. The statements BASIC (jinnig), MOVIE (jinnig) and GAT (jinnig) will be accepted on program lines, but will give error messages if you try to run them. On the 128S Spectrum the statement MOVIE (jinnig) will be accepted as a program line, but treated as a GAT statement on running. The bug in the 486 machine is due to the fact that the syntaxes of these interface One commands were incorrectly anticipated. On the 128 a wholly new syntax routine is provided, and the commands BASIC and GAT have been taken over for use with the silicon disc system, whilst FORMAT has been taken over for use with the 80282. MOVIE however, is not used at all (and it surprises me that the original idea syntax has been reproduced in an entirely new syntax routine in the new ROM. Why?)

Hook Code Errors

Hook codes are used to call subroutines in the Interface One's Shadow ROM. There are two errors in these:

The BASIC ROM error

(from Master Four ZX Microdrive)
Hook code 2F (\$1A0...H) was intended to read a block of data from the "H" channel (the local area network). The carry flag is designed to indicate success or failure, but unfortunately the carry flag is subsequently destroyed by a call to the binder module routine.

The SET-MON error

(from Master Four ZX Microdrive)
On version one issues of the Interface One, hook code 26 (\$21...F) MON accidentally calls the CPU...M routine instead of SET...M MON, making it identical in operation to hook code 22H. This bug has been cured in later editions of the Interface One, and in these later editions it correctly performs its task of creating a temporary "M" channel in the channel information card.

Interrupt Errors

The monopolising of it
Though not strictly an "error" as such it is worth noting that the Spectrum's interrupt routine contains the instruction INC (R1+4), which is intended to increment the high byte of the (R1+4) variable (when necessary), however to do this R1 must have a value of 003A at all times while interrupts are enabled (unless of course you define your own interrupt routine). Unfortunately if it is not



temporarily assigned with this value within the interrupt routine itself. The effect of this misadventure is that the value contained by R1 must never be changed (unless interrupts are disabled or an alternative interrupt routine supplied). The reason is, because it means that a machine code register which could have been available to us now must not be touched. It is possible to cure this condition by using the program at Figure Three as an interrupt routine.

The SWAP error

The SWAP routine which switches between the two ROMs of the 128S Spectrum invariably enables interrupts, which may not always be desired. Fortunately this error may be cured by the program of Figure Four. Simply write the instruction JP SWAP...C to location \$660, where SWAP...C is the address of the Figure Four program.

The PLAF error

All address 0000 (in the 128, or 000C in the 128+2), the SW...RICH subroutine is called from the old ROM. At this point interrupts are disabled and it is now being used as a pointer to the master PLAF information block. Unfortunately because of the two bugs listed above, interrupts are enabled during the SW...RICH call, leading to conflicting the wrong value. This means that if an interrupt were to occur during execution of the subroutine then that would be a one in 2555 chance that 07+40 will be corrupted — this corresponds to the volume setting for music channel A. In practice this circumstance is very rare and I have not known it to happen. Rewriting the SWAP routine as in Figure Four will cure this bug.

ERROR Errors

This last group of errors are bugs in the Spectrum's own error handling routines (essentially I find three most annoying).

The INVALID FILENAME error

(from Master Four ZX Microdrive)

Bugs in the ROM

If the Interface One is attached then the error message "Invalid filename" is replaced by the message "Resource in BASIC" which is not particularly helpful.

The BEEP into GLOBE error

(from Master Four ZX Microdrive)
In version one of the Interface One it is possible to create unusable areas of memory which are not reclaimable (except in machine code of course). If you BASIC into a GLOBE statement which refers to one of the Interface One channels then the memory used by the screen is not reclaimed. The bug has been cured for version two of the Interface One.

The INVALID DEVICE EXPRESSION error

Most ironic of all is the device error which only occurs with the combination of ZX Interface One and Spectrum 128 or 128+2. If you have a BASIC line such as

1000 OPEN "47X"

(the file number must be greater than 999) then you should by rights get the error message "Invalid device expression, 1000" — indeed, this is both. The Spectrum does indeed attempt to predicate the message for us. Unfortunately the message is far too long to fit on a line (the thing three characters in the error message will not fit on a line of only thirty two spaces). The Spectrum 128's monolithic little old screen editor only allows for a lower screen of two lines (including one blank line above the error message), but its particular error message takes three lines, not two! If you're using only the lower two lines as the editor then the effects of the bug aren't too bad; you merely get a few spurious things happening at the bottom of the screen. If you're using the whole screen as an editor however then the bug is fatal. Causing an unreclaimable system error in BASIC model A, shame really — the poor thing was only trying to tell you about a bug in your BASIC. Never mind — these things happen!

THE PAWN



**Gordon Hamloff takes
his 128 into the mystical
land of Kerornia.**

**The Pawn (128K only)
Rainbird
\$14.95**

When of 128K Spectrum (special?) must be beginning to wonder if software houses actually take them seriously. The best games that they have had so far are reworkings of old 48K standards, perhaps with some extra sounds or better music to keep them happy.

Fear not! All that has now changed with the release of *The Pawn* — a superb adventure written by Magnus Roloff and released by Rainbird. Even so, you are not getting off the game I am afraid, as even with all the extra memory available, there is still no room for the pictures that made this game famous on machines like the 31 and Amiga.

The Pawn has had a somewhat strange development. Originally written as a test only game for the 128, it was then instantly forgotten about like most QL software. It next appeared on the Atari ST complete with some stunning graphics — the best ever seen in an adventure by several orders of magnitude. Conversations were then written for most disk-based systems as the illustrations could

be loaded in separately where necessary. But there is simply not enough room in the 128, so it's back to text only.

This is not necessarily a cause for mourning of both and testing of PCs for even in this form, the game makes good of any other Spectrum adventure.

Kerornia

The game is set in the magical land of Kerornia. The old King, Sirk, is losing his grip on the country. There have been assassination plots and rumours of insider dealing within the Forthrighton Real Ale Company. This is an attempt to stop a take over by the Rooblycub Dearth who are disciples of the Inari whisky brand. On top of all that, there is a general election in the offing with one of the main candidates being Gunga Baronburger, a dwarf violently opposed to the royal family. Into the middle of this political turmoil comes you.

Your first problem is that you are wearing a wand band which, try as you may, you cannot remove. This is unfortunate since it prevents you from crossing a thin red line that surrounds Kerornia. You haven't got the slightest idea of this edge what on earth is going on or what you are supposed to be trying to do. As you travel about, so you get a message to deliver: meet a person who tells about laughing whenever he sees you, find a snowman standing guard

outside a tower, some platemasters arguing about whose turn it is to get the supper and of course, you have the chance to vote.

Location descriptions are long and slow, so much so that the lack of illustrations doesn't seem to matter too much. The problems are both both original and difficult — don't expect to complete this one in one sitting.

The main thing that sets *The Pawn* apart from other adventures is its parser, which can quite justifiably claim to be state of the art — even better than the legendary Infocom parser. This may seem like a small point to pay so much attention to but it soon becomes apparent that playing the game is a lot easier than most adventure games. Not because the problems are easy but because you can enter commands as you would say them naturally. There is no need to go searching for exactly the right combination of words.

One example taken from the instruction booklet, and not I hasten, to add part of the game, shows how powerful commands can be strung together. "Go all except the doors but not the north door then kill the man, eating cheese with the contents of the wine glass. Remove the streets and use it to tie the pole and the horse together".

Really impressive stuff even if the command is a load of gibberish.

The game comes beautifully packaged — a box containing two booklets, a map and a 64 page novellet written with the tongue never once leaving the cheek. This serves two purposes. Firstly as an anti-piracy device, as you need to look up certain words and secondly as a help section. A number of clues are available to you but only if you are prepared to type in a lengthy string. Even then, you may not be allowed access to the clue if you have not solved enough of the game and the concern that you get can be downright maddening at times. You have been warned.

It is a pity about the pictures but you can't have everything! Perhaps if Alan Soper does get round to launching his Spectrum disk system they will eventually materialise but don't let that thought stop you buying a copy of the game. Now if you enjoy adventures, then *The Pawn* is a must for your collection. Even if you are not a fan, buy a copy and see what style of art-adventuring is all about.



SPACE GAMES OFFER

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Martin Orrego

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Are you decisive?
Could you command a
space freighter? Do
you hire the Gork or
Fligronk?

PSI-5 Trading Company
US Gold
£9.95

Commanding a star freighter for the PSI-5 Trading Company isn't as easy as it's portrayed in games like *Star Wars*. The problems lie in the fact that you have to carry perishable cargo to far flung parts of the galaxy. In a sense, help of a ship that's crewed by a collection of galactic rodents, while being shot at by every pirate in the zone.

Having survived the earlier space (although *Star Wars* is the business) of carrying 'hazardous' cargo to Koon's, it's time to traverse 38 constellations for your last crew positions. For each position you have six weapons to choose from, and can even pick up three more, but I doubt that'll help you. Since that and error will sort out the game from the bad and the ugly. I opted for a 350 year old holy cruise to handle the weapons, a re-breathing Fligronk to scan space for enemy ships, a yellow blob called Vira to navigate, the green warty Fligronk to man the engineering department and finally (1389) to repair things (since hell a robot I thought said knew what to fix and where). With the crew in position and me in the captain's chair we headed for the stars.

PSI-5 TRADING COMPANY

The screen display is a mass of windows, instruments and displays to you show orders to your crew that show your exterior view, speed, compass, damage and supply gauges, a picture of the crew member you're talking to and their controls.

You can select the crew and then their actions from duck-shaped menus and order engineering to get power through to the starboard systems, navigation to plot a course and accelerate, scanning to search and identify other ships and weapons and repair to standby. There's just to get started.

The fun and games really start when another ship approaches. If it's a friendly ship and you accidentally fire at it you could break a long standing treaty but if it's an enemy you can't afford to leave it alone. Now you must act quickly as scanning must get a

fix before weapons can fire any of its four weapons either at a specific target or at will. The battle is shown in your view window but you probably won't get a chance to watch it as things really heat up. Messages flood in from your crew as systems are damaged and need repairing.



If you survive you may get a chance to negotiate repairs. Better the pirates strike again. Fail, and you'll be destroyed and the pirates will ransack your ship. Either way your status report will count up the profits or losses of your mission as it deducts repair costs, casualties and lost sales from cargo profits, entry bonuses and security to stopping the Chank, Zinkod, Fligronk and Zinkod pirates.

There's no doubt that PSI-5 Trading Company is an excellent game but is anyone good enough to play it?



STATUS Display & Bank Control Page +
REPAIRS FIRING SUMMARY REPORT

	BIS	BLA	CAN	THA	BI	BL	CR	TH
VanLoos
VanLoos
FLYPOKE
Barry's
Barry's
CHANK
Unknown



GREAT



Head Over Heels
Ocean
£7.95

The authors of *Bringing Out the Best* return with another hit

When you're in the kitchen, you're in the "zone". It's a place where you can be creative, and that's what *Head Over Heels* is all about. The game is a fun, fast-paced, and colorful way to learn about the world of cooking. It's a game that's perfect for kids and adults alike. The game is a fun, fast-paced, and colorful way to learn about the world of cooking. It's a game that's perfect for kids and adults alike.

Head Over Heels is a game that's perfect for kids and adults alike. It's a game that's perfect for kids and adults alike. It's a game that's perfect for kids and adults alike.

When you're in the kitchen, you're in the "zone". It's a place where you can be creative, and that's what *Head Over Heels* is all about.

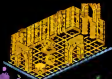
The game is a fun, fast-paced, and colorful way to learn about the world of cooking. It's a game that's perfect for kids and adults alike. The game is a fun, fast-paced, and colorful way to learn about the world of cooking. It's a game that's perfect for kids and adults alike.

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Brought to heel

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chance, you could feel the game dip to the touch. Form a ball, then let it go. Both sides can feel the ball.

[illegible]

Seventeen years after the initial
release, the film has been
re-released by the same studio
and now is available on DVD.

When frequency of water use is
constant, as you have to, getting
them all in different conditions
is hard.

[illegible]

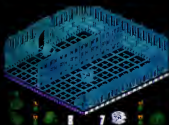
Background

McNair's report also shows that the 1990s have been the best years for the development of the use of state crime option which allows you to restore the crime if the state where you had been the victim, the family or the victim's estate, or the state.

[illegible]

Interviewer: Yes, it's more information. But these three things seemed a little tricky and questioning is going to take time. The answer to a question thought out is different than the answer I which is probably to control is actually just is the answer that I will give.

15. Suppose that the state of nature that results in an "early" market for the new product is more likely to occur when the economy is in a recession than when it is in an expansion. How would this affect your decision for the firm?



INTO THE 128

Part Two by Toni Baker

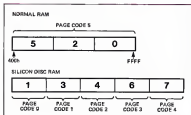


Figure 1.

In this, the second part in our series on the Spectrum 128 and the +2, we turn our attention to the file storage system called the **SILICON DISC**, or **RAMDISC**. In BASIC it is possible to save programs, data, or code onto silicon disc in much the same way that you can save them onto cassette, except that the command for accessing the silicon disc system is **SAVE** instead of just **SAVE**. Silicon disc has the advantage of speed — the file is saved permanently in an instant.

Unlike there are corresponding commands **LOAD**, **VERIFY** and **DELETE**. The disadvantage of silicon disc is that everything stored there will be wiped out when the power is disconnected.

In this article we are going to look at the silicon disc organization from a machine-code point of view. In point of fact, the terms "silicon disc" and "RAMdisc" are not very accurate. There is no disc of any description inside the 128; there is only 128k of RAM memory. The system is called "silicon disc" purely because it mimics a normal disc drive, but a disc system it certainly is not.

RAMpage

Last month I told you about ROM and RAM pages. This month, I must dwell on the subject of RAM pages for a little longer. As you recall there are eight 4kK pages numbered from 0 to 7, and each page contains 16K, making 128K in all. What you

now need to realise is that these RAM pages are divided into two distinct groups, which we may refer to as "NORMAL RAM" and "SILICON DISC RAM". Figure One shows this distinction diagrammatically. As you can see, Normal RAM contains three 16K pages, making 48K in all — in this series the 128 is not really much different from the old 48K Spectrum. Normal RAM contains a screen, some system variables, the current BASIC program together with its BASIC variables and optional information, the calculator stack, the user-defined graphics, and so on — just as before. Something new in the 128 happens in the other section of RAM — the silicon disc area.

Normal RAM consists of RAM pages 5, 2 and 0 (in that order). You will recall that page 5 is permanently mapped to address 4000h, and that page 2 is permanently mapped to address 5800h. Under normal circumstances you will find that page zero is paged in and mapped to address C000h — this means that normal RAM contains 48K of memory with continuous addressing from 4000h all the way up to FFFFh.

The same cannot be said, however, for the silicon disc area. This consists of RAM pages 1, 3, 4, 6 and 7 (in that order), however, none of these pages are permanently mapped anywhere. This means that in order to access part of the silicon disc memory you must page in one of its pages, which

will then reside at address C000h in page-04 RAM group zero (which must be entered afterwards) if it is not possible to access all of the silicon disc area of ones.

To make the matter I shall introduce the concept of **PAGE CODES**. You see, each of the eight RAM pages possesses a **PAGE CODE**, which is a number between zero and five.

NB: THE **PAGE CODE** IS NOT THE SAME THING AS THE **PAGE NUMBER**.

It is the use of page codes which enables us to distinguish between the two different regions of RAM, and to access the silicon disc area sensibly. Pages 5, 2 and 0 (ie normal RAM) all have a page-code of five. Pages 1, 3, 4, 6 and 7 (ie the silicon disc area) all have page-codes less than five — in fact they run in sequence: 0, 1, 2, 3, 4.

This means addressing of the Spectrum memory is a little simpler. Last month we established the convention whereby every byte in RAM could be referred to by a five digit hexadecimal number — for instance, the first byte in the silicon disc area would be referred to as address 1C000. The "1" at the start refers to RAM page one (and the remaining four digits are the address within that page).



Figure Two.

We can do almost exactly the same thing with page codes. For instance, consider again the first byte in the silicon disc area. This would be RAM page one, but page one has a page-code of zero (see Figure One). Therefore we can specify the byte uniquely by supplying the page code (zero), and the address (C000h).

To avoid confusion with absolute page numbers, we will not fuse these together into a single five digit number. We will, instead, define a new convention as follows: place the page-code within brackets, and follow it by the address.

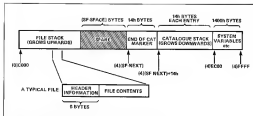


Figure 1

Using this second convention, the last byte of RAMdata, in addition to having an absolute address of 00000, also has a PAGE-CODED ADDRESS OF 00000.

Just to give you a better grasp of the new convention, here are some equivalents, in both absolute and page-coded address systems:

00000 = 00000
00001 = 00001
00002 = 00002
00003 = 00003
00004 = 00004
00005 = 00005
00006 = 00006
00007 = 00007
00008 = 00008
00009 = 00009

(Note that in the old absolute convention the last three items could also be related to as 00000, 00001 and 00002 respectively.)

Edge of the register sense. The point is that a single register pair will not hold a 16-bit address, since a register pair can only hold four hex digits; therefore, to hold such an address in machine code we will require three registers, not just two. We may use either the absolute or the page-coded convention, whichever is most convenient at the time: you will find that when working with the silicon disc and page-coded addresses are a lot more helpful. As an example, suppose we wanted to store the page-coded address 00000 in the register stack A0. To do this, A must contain 04, whilst B must contain 0000. As long as you remember that this is a page-coded address and not an absolute address then you won't go far wrong.

The advantage of page-codes is that they make things everything nice — for instance, the whole of normal RAM has the same page-code (0) and furthermore, the page-codes of

The first nine bytes of a standard file contain the following header information:

HD_00	(one byte)	File type	00=program 01=numeric array 02=string array 03=bytes of code
HD_01	(two bytes)	Length of file, excluding header info	
HD_02	(two bytes)	Start address from which file was saved	
HD_03	(two bytes)	Length of program, or name of array	
HD_04	(two bytes)	Auto-run file number	

Figure 2

the silicon disc area run sequentially (04, 01, 02, 03) and (04). We may use this last to our advantage in machine code. For instance, suppose A0L contains the page-coded address of a byte in the silicon disc area. How may we calculate the page-coded address of the byte by following it? Figure Two shows a possible solution. Imagine how naive this simple subroutine would be, because if we were to use absolute addresses instead.

Memory

The very last subroutine in this month's main program is called PAGE_1(A), and its purpose is to page in the RAM page whose page-code is held in the A register. If the page-code specified is (0) then it will page in RAM page zero, restoring normal RAM. The subroutine works by converting the page-code to an absolute page number and then paging in normally. This subroutine is the key to using silicon disc memory, and both the 128 and the 128+2 contain similar subroutines in their new ROM.

Now it is time to look closer still at the silicon disc memory. Figure Three shows how this memory is organised (leaving upwards from address 00000 is the file stack. Every time a file is saved it is added to the top of

the file-stack. Each entry in the file-stack contains nine bytes of header information followed by the file itself as it would be saved on cassette or magnetic tape. Figure Four shows the meanings of the nine bytes of header information which precede each program, DATA or CODE file. Note that under normal circumstances this header is transferred to the system variables HD_00 to HD_09 (0000 to 0009) when a file is being processed.

Growing downwards from address 00000 is the catalogue stack. Each entry takes exactly twenty bytes, so the first entry will begin at address 00000, the second entry at 000020, and so on. Each entry in the catalogue stack is a reference to one of the files in the file stack — in other words, there are always exactly the same number of entries in the catalogue stack as there are files in the file stack. The top of the file stack is pointed to by the system variable (SP_NEXT) of address 0000. This is a two-byte system variable containing an address which is always assumed to point into page zero (ie page-code 00). This means that the catalogue stack can never grow beyond 000000 — as a consequence there is a maximum limit on the number of entries the catalogue stack may contain — five hundred and sixty-two in fact. This means that

The file system may in turn contain at most 562 files, and therefore the maximum number of files which may be saved in RAMdisc is 562, however until the files are saved.

At the top of the catalogue stack is a forty byte information block called the "end-of-stack" marker. Only three of its bytes are important, however. Figure five shows the information contained by each entry in the catalogue stack, whilst Figure six shows the corresponding information contained by the earliest end-of-stack marker.

Bearing all of this in mind, we can now examine the main program of this article, which is called **RAMSCALD**. The program may be called from BASIC with the command: **RAMSCALD:000 33333** which runs the machine code from the label **RAMSCALD**. Note that **RAMSCALD** must be less than 65535, so that the switching of pages will not affect the machine work.

The program will list on the screen a complete and highly detailed catalogue of everything saved in EAMedex — it will tell you what kind of file it is, its current line number (if it has one), its intended location (if its COOD), and so on. If you examine this catalogue you

This is a typical entry from the catalogue stock, assuming that *li* points to the first file.

0x+00	SE_HASH	(one byte)	Filename, with trailing spaces if necessary
0x+0A	SE_START	(three bytes)	Page-coded address of start of file in file-steps
0x+0D	SE_LEN	(three bytes)	Length of file, including header
0x+10	SE_END	(three bytes)	Page-coded address of last byte in file (stock beyond) and file
0x+13	SE_FLAG	(one byte)	Normally zero! (unless file contains uncompress)

[illegible]

This is the information contained by the end-of-conversation marker, assuming that it points to the first byte. Note that this marker is indexed by $LCRC - NDCN$.

0x+03	(int bytes)	Not used
0x+04	IP_OFFSET (three bytes)	Page coded address of first space byte in RAMdisc.
0x+05	(seven bytes)	Not used

[illegible]

should see how the silicon disc area works, quite comprehensively. If you're a masochist you might also like to visit the last article in the *386/486* ADX.

CHANNELS series with single
output parameter: 1000

Next month I'll be looking at the possibilities for extending WISC on the file system. Then

[illegible]

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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Disc Manager
Bradway Software
\$10.50

[illegible]

CD-ROM Manager from Broadway Software is a comprehensive file and disc maintenance utility, including a file copier, 5 disc doctor, and comprehensive Triage manual. The loader program provides you with four options: Disc doctor, File transfer, Select load disc, Select save disc. Disc doctor provides facilities for examining the free space left on the disc, printing a full catalogue, or getting even more information about a file. It allows you to select files for archiving, remove a file or read a block from the disc into the

Spectrum memory, the contents can then be examined, edited and finally written back to a disc.

The arrangement of the files on a disc, along with the location of the empty sectors is provided by the "fat block" facilities which will also fit to the printer. "Locally block" allows you to enter the contents of a block and the "write block" facility permits saving the contents of an edited block back on the disc after suitable checks.

The file copier allows you to select and copy a file or groups of files from one disc to another. The program checks to make sure that the save or load disc is in the appropriate drive. If you copied a disc from the 720K 5.25" drive to your 720K 5.25" drive without difficulty. However, it does this by loading files into the computer's memory (256K is available) and creating a keypress before saving (otherwise it's necessary to a huge break on the keyboard). The copy program is optimized to use the minimum disc space and files are copied in the order selected. This allows you to keep pre-cious groups of files together, and also to design a precedence to files which have to be saved on a fairly full disk.

Finally, the instruction manual contained some invaluable

Information on how to recover damaged or erased files (the exact, of course, merely defines the catalogue file). It tells you how to search the disc, check the blocks, re-insert a horse into the directory, and recover the file that went missing. Great stuff.

Most of my griefed concern two-disc systems or large capacity discs. For those with a single disc system, I would recommend the program, go ahead and buy it. It is still helpful to users of both disc of similar sizes, and indeed, useful, though not perfect, for those who have discs of two different sizes. My principal intentions were with the clumsy transfer system, with a two disc system, the transfer, once initiated should be automatic to the end. Similarly, you have to go right back to the start every time you wish to change source or destination drive, and then reload the transfer program, not a good idea. There is no single-key "compose" option, so "rename disc" option, and no single-key "format" option. It is useful if you wish to enter the catalogue file, particularly necessary with large-capacity discs, but again this facility also is lacking.

Hopefully, for users of more complex disc systems, an upgrade is in the pipeline.

John Howe

**The British Empire
attempts to strike back.**

**Zulu War
CCS
£8.95**

In 1879 General Chelmsford, commanding the British forces in Africa decided that the only way to stop the disputes between the Xhosa and the Zulus was to take over their two countries and govern them. The resulting 'war' action was one of the worst mistakes in British history as the highly trained British troops gained



ZULU WAR



down the Zulu warriors. The latest wargame from CCS has based the action in the Zulu town to produce a challenging wargame with a difference.

Two separate scenarios are included on either side of the game table in which between 20,000 and 40,000 Zulus attack unprepared British segments.

The British begin both scenarios arranged in their rigid square formations that you must manoeuvre from the broken walls and trees that form the barren landscape. The size of a square that is made up from soldier icons indicates the size

and strength of the segment and ranges from the strongest 5x5 down to a single soldier although even this represents 60 trained soldiers. The Zulus arrive at you in their famous horned bull formation with the main body supported by two flanking horns. This compact the enemy under a wave of spears. Even though the figures are little more than blobs which shuffle along at a snail's pace, they make a refreshing change from the usual wargaming symbols and remind me of old old figure wargaming days.

The game itself is a tactical

ing clash between two totally different but well organised armies. The British have the advantage of fire power and can gun down the Zulus from a distance and have the formidable lance and cavalry segments. These key soldiers can not only shoot from a distance but can also keep Zulu lines with charges and fight bravely with their swords. The Zulus outnumber the British by fivefold and use this advantage effectively as they attack in massive waves. They are faster than the armed British and are formidable hand-to-hand fighters. As British commander you'd better not let them get too close or you'll quickly lose troops and firepower and lose an Alamo style defeat.

These sheets of play advise that there is a scenario that you can win, one where you just get broken and one that's a total disaster. This forms a highly addictive formula that will drive you back for more.



GREAT



GUNRUNNER

A super-smooth shoot 'em up from Hewson.



Gunrunner has an instantly repetitive plot (save the planet from alien) but very memorable gameplay that will undoubtedly appeal to arcade players.

Even the basic gameplay idea sounds less than promising — it's a left to right scrolling game in which you manoeuvre your Gunrunner character over a pipe system, avoiding hovering scorching orbs, bombs, deadly darts and various lethal flying



enemies. Several times, the screen shows temporary invulnerability again direct hit and the jet pack will give you a short-lived airborne interlude.

If you manage to fight your way through a level you must look forward for a pedestal which will transport you to the next level. A good (but exasperating) touch about as you stand on the pedestal when a high minute wave of enemies can dispose of you before you are transported. In between levels there's a bonus shoot out, where hovering in your jet pack, you must pick off waves of hostile enemies until you are hit.

Gunrunner is a sophisticated shoot'em up with advanced animation, challenging gameplay and plenty of shoot'em up action. Its ten levels of difficulty should provide enough enemies during, dodging and shooting to satisfy even the most demanding arcade player.



objects. The execution of the game, however, is superb: your character is remarkably mobile and very smoothly animated. When a string of flying podgits appears behind you, your character can duck down, turn and shoot in one fluid movement. But this is just one of his actions, he's just as good in the running and jumping departments too. All this agility is

essential as the boards appear very quickly and it's no sin either if you go back to the beginning having lost one of your lives. There's no telling how the defending hardware will have re-grouped for the next game.

Along the way there are objects to pick up like the power, poison shields and a jet pack. The screen allows you to clear the screen of enemies



Q L COLUMN

Brian Becker with news on the QL scene.

IF ALC is not kind and my QL went the way of all flesh the other week, I'm back in working order but not soon enough for me to play around with some software packages long due for a review in these hallowed pages. So general news and rumour will have to do for this month. First of all, let me correct a previous report on ALC Electronics' up-coming upgrade to be up-coming QL-grade kit. Contrary to previous reports, it does not include disc drives or a disc interface but the main box does have room for their inclusion. Those pursuing West Germany's ALC may devise good QL products but their English leaves something to be desired and their conduct a couple of Microsoft days was wasted in such a way that I read the inclusion of disc drives in the up-grade kit. So forget any great bargain and while the ALC is still looks good, I'm quite as good a deal as I looked back then. With a bit of luck, the folk at ALC will hire an English PR release writer and concentrate their time on other and better things.

In the meantime, Digital Reaction (which is handling the ALC upgrade kit in this country) is releasing its own keyboard and an upgrade kit is available. I'm not sure at the moment whether the upgrade kit is the ALC one or not but the keyboard is Digital's. Its known as the "Deluxe Keyboard" and sells for \$8995. It has 83 keys with on-board memory pad and is designed for maximum typing convenience. It looks suspiciously like a prototype I saw exhibited at the same price at a recent Microsoft by some company or other based in the North and, if it's the same one, it looks like a bit of sheffling and dealing has been going on and the Digital Empire

is growing by leaps and bounds. The QL ship has gone under and somebody had to reach the lifeboat first. Given Digital's excellent product record, I'm glad it was there and — if Digital acquires a virtual monopoly on QL products or their distribution, it should prove no bad thing.

Digital's deluxe keyboard is compatible with all QL disc drives/interfaces, RAM expansions, printers, mice and software. In other words, it is fully compatible with the myriad products and additions which are either still available or had their brief moment of glory in the marketplace. Is an external board as you get another peripheral but I connect easily by cable to an interface fitting into the 8049 co-processor socket. No soldering or electronics experience is required. There are five user-programmable function keys. Its black and matches the old Sinclair box that we know and love so well. I haven't had a chance to type on one yet but (if it is the same keyboard as the prototype I played with at that Microsoft) the feel of the keys is excellent and rivals the BBC and my very own electronic typewriter. I will be reporting further details when I get one to try for real, kick around and otherwise abuse for your enlightenment.

Meanwhile, over at Schan, the company's sixth QL keyboard is now available with plastic moulded keys and an external IBM-type QL board is due on the market in a few weeks. If Schan mean in schedule, it should be available by the time you read all this so give them a call and ask how much it costs (they neglected to tell me) or whatever else you want to know about it before I report further on the matter. Besides, Schan likes calls. The MC called me up a week or so ago to ask when my review of the sixth keyboard was coming out because he hadn't had any calls from anybody but there as yet I pointed out that his keyboard review was on the stands at the

moment but didn't mention that this column just might not have any readers to call him up. So help prove that there is intelligent QL life in the universe and ring up Schan if you are interested in a keyboard or if you would like to show them that somebody out there really does care.

For the latest on the software front, we have to go back to Digital yet again. Seen to be released is a desktop publishing package or (as the company was being a shade quiet on the subject for the moment) something along these lines. This can only be good news as desktop publishing is not only all the rage but is ideally suited to the QL which has few other means to appeal to. A month or so ago, I briefly reviewed the *Front Page* QL desktop program for the QL which so far has the field pretty much to itself, and noted the QL's growing popularity with small groups putting out newsletters, handouts and so on. With the QL being cheap (if you can still find one as the High Street) or a second hand bargain, is a natural for groups without a lot of money to throw around who need a quality computer with lots of good, economical software available. The *Front Page* is a good product with, as the company admits, certain limitations dictated by the product's low price. If Digital is entering the field, I would expect an excellent product at a reasonable price.

Last month, I suggested that all desktop QL owners without disc drives immediately start looking for some. The last few weeks have only reinforced this opinion and, to me, because an old drum, I stand behind this opinion even more firmly than before. I've now had several more microdrives go haywire and while most of the data can be saved the things are now as outdated as the dinosaurs and for less interesting. If you are going to keep the old QL ticking over for any serious purpose, disc drives are inevitable and you might as well bite the bullet now as later.

BUDGET GAMES

Budget games are accounting for more sales than ever. ZX looks at the latest releases.

■ If the computer press is anything to go by, budget software is taking over the world. Nobody is buying full-priced games apparently (unless they're conversions of coin-op titles), and certainly Mastertronic, if

they're not taking over the world, are taking over Melbourne House.

There are a number of software houses competing for the budget market but for the most part it's a three-way fight these days. Mastertronic were the first in the field, closely followed by Firebird Silver range, and these two have been straggling it out enthusiastically for a while now. Recently though, Code Masters, the label founded by a couple of ex-Mastertronic programmers, has made quite an impact with games such as *Delta* (simulator) and *Teira* (cognita).

This month we've received some new releases from all three of these companies, giving us a good chance to compare a

variety of products and take a look at the state of the (budget) art.

Firebird

Personally I've not been as impressed with Firebird's stuff as I have with Mastertronic's or Code Masters, but they have been improving a bit lately. Their last was perhaps their best release for the Spectrum, and that is, whilst basically the same, called a couple of hills to the addictive *Spinout*. Their latest game,

TURNBACK, is a fairly run of the mill effort. You have to find your way around a school building and collect \$50 to pay for a broken window. You have to contend with the usual assortment of deadly spikes, ladders and so on, and while this is the sort of thing that could have been sold at full price a couple of years ago it's still a bit bland by today's standards.

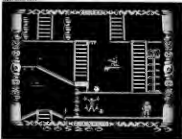
Mastertronic

There were quite a few Mastertronic releases just after Christmas, but they've been a little bit quiet lately (probably busy planning to release Melbourne House's book catalogue or budget titles...)

They recently released the £2.99 label, **Buildlog**, to their shops and got off to a flying start with *Feed* (reviewed last month). *Colony*, the latest **Buildlog** game (all quite in good), is basically a maze game set on a distant planet in which you have to control an android and protect the troops planted by the human settlers.

Colony is very much in the mould of Mastertronic's £14.99 games, and graphically been quite a masterpiece to many of their other maze games, though for the additional pound the

Super Britain House





The Maze

presentation and control options have been made a little more sophisticated.

Meanwhile, back on the \$1.99 side, **Reinforcer** is a bit of an oddity. It claims to be an animated adventure requiring no inside skills at all. This isn't strictly true as the game puts you in control of yet another android (this time known as M88), one which looks and moves like a British ball, so you'll need a little bit of arcade skill to control its movements. Your task is to move M88 around a damaged spacecraft and repair its engine and scanner systems. Along the way you'll be presented with a number of logical puzzles, but as well as solving these you'll actually spend a fair bit of time figuring out just what the point of the game is (at least I had to, anyway). It's not the sort of game that will appeal to arcade addicts, but if you're into games that require a bit of thought then **Reinforcer** could prove quite addictive.

Code Masters

It's been a good month for Code Masters, with five of their games arriving for review, and, apart from the unfortunate **Brookside** (reviewed elsewhere this issue, along with **Transputer**) they're all doing quite well. **Transputer** is a good version of the old **Sorcerer** format, and **Wheel Hunters** (featuring voice synthesis) is one of the better platform games to come our way recently. Set in a haunted house, the game tells you the tale of rescuing someone who has been trapped within the house. There are all sorts of ghoulish sprites out to do away with you, but fortunately you're armed with a ghost-busting rifle which emits the rays of light that's waiting at an original

about platform games, but this one seems to have been thought out quite well. You use your rifle by moving a highlight right across the screen, but while you're doing this your character is immobilised and this adds an extra little edge to the game since you have to be quick when it comes the choice of whether to use the rifle or just run away.

Super Robin Hood is doing similar lines, except that it's Robin Hood helping out Maid Marian in a medieval setting.

Star Runner is from programmer Christian Uggahøj (who's just released a full price game on Hewson's label). It's a simple game involving guiding a running figure along a route dotted with life pills, stumbling blocks, robot guards and the like. The graphics are quite nice, but the game does seem to be a bit too simple to offer a lasting challenge.

Generally speaking, **Code Masters'** games seem to be a little less formulaised than those of **Hystoria** or **Moslematics**, who at times seem to be a bit over fond of the dated maze game format. This seems to be paying off for the newer **Code Masters**, and they've done well to establish themselves so quickly whilst other budget labels (even from such big names as **Eile** and **UL** [200]) have failed to make a dent in the opposite **Moslematics/Thebed** monopoly. If I had to pick a couple of games from this month's budget releases to go for, I'd choose **Transputer** and **Ghost Hunters**. That puts **Code Masters** ahead this month, with **Moslematics** in second place and **Hystoria** in third.

Well, a month is a long time in budget software so perhaps next month things will change (perhaps with the release of **Star Runner**).
Byron Sam Proctor...

Ghost Hunters





MINDPLAY

Adventure, news, reviews and advice, from Pete Swasey's dungeon.

If finally the supply of adventures dries up at this time of year. Not so in 1987, some big names for review this month, with more on the horizon.

The real biggie is the *Shadows of Moorh*, the intergalactically named sequel to *Lord Of The Rings, Game One*. This has been long awaited by adventure, though not necessarily in eager anticipation. More in hope that it would be better than the last game.

The first adventure was, to be frank, pretty awful. It was mind-numbingly slow. Not slow due to that tedious routine of moving

pictures of the character around the screen (might have looked a good idea on paper — but boy was it poor in practice). The graphics were rawer than ones in TV shows, and some quality loss (almost level 9 standard). The bad was that, the producers even during the recording programme presumably thought it would be easy to add little anachronisms like photographs and references to history, myth, music, but Tolkien fans were rightly incensed. Some interesting features were altered, but the programming had run away with itself, and the game had been swamped by the attempt at technical sophistication (in which respect *LOR* was not that special either), when compared with level 9's *Warrior In Paradise* from around the same time. You needed remarkable perseverance to reach the end; it did not incidentally. Add to this an unaffordable (for most

people's) price of \$1495, part of which paid for a book, which more of the potential buyers would already have, and you have a true software disaster. Alan Davis, author of *Exorcism* and fellow ZX contributor, said this about it: "After months of stress — oh, it was relentless for a few days — perhaps a case of the Emperor's new clothes — but now it's gotten the dust, unpolished and shined, undoubtedly, it's hard to forgive Philip Mitchell for this." To find out whether he deserves that diatribe, read the review.

Before I press on (all to be done this month) a word about ratings, or rather eight words, do not take too much notice of them. I am a terribly indecisive person — well, quite indecisive — not very indecisive — anyway. I am fairly certain about which of the games to give a game. And, of course, games which gain the same rating are not of

identical quality: a "Great" game could be just a middie-down away from "Miserable Midon", or almost a "Good" but saved by a particularly interesting feature. The important point is to read the review: the rating is only a rough guide. The only certainty is that a "Miserable Hit" is of outstanding quality — but even then, it may not appeal to everyone.

Still, enough of these meaningless musings. On with the review!

EARTHSHOCK 5th Day \$3.95

Another time again, brights Gem pioneers in quality Budget adventures, and the people behind the wonderful H&H. This is in their new "Great" range, though pictures are conspicuous by their scarcity, and when they do appear, they are distinctly overdone.

Earthshock has a lot of text, because it is a computerized Quilford game. On one side of the tape is the text and graphics version, where the words are pretty verbose, as the other is the text only, where veritable floods of text appear. The writing is generally above average, though sometimes tedious.

The theme is a bit dippy, a futuristic science-fiction thing, where as a member of a post-apocalyptic tribe you must battle with the deads who have taken over the world. I'm fed up with working out how to use futuristic technology (there always seems to be slots for inserting cards into). Still, there are some nice touches, and the scenario is pleasantly detailed. You receive an extremely full instructional booklet, very good for four quid.

The adventure is entertaining enough for budget, though vocabulary is weak (for example, with 'a pile of rubble,' SEARCH RUBBLE is trivial, SEARCH FILE and 'you feel nothing unusual'), and the problems are nothing arounding. An innovative feature is 'three way' play — at one point you make a decision which sends you on one of three sub-quests, and determines one of these end-games. So theoretically you can play three times. Goodbye for yourself whether this is a good or gimmick.

Some above-average features, enjoyable, but I fear 5th Day are capable of better.

GOOD



THE SIDNEY AFFAIR Informations \$3.95

The Sidney Affair sequel to The Vera Cruz Affair is in a very similar style, and has an unimagnitively similar title. Again you are a French police chief, again there is a gritty reader to be solved, and again you have the even harder task of using the "Diamond" network, France's police computer system.

As before, the game has two sections. In the first, the scenes of the game (two of them) are portrayed, with rather neat graphics, and by moving a magnifying glass over them you glimpse to them in detail. Here you can find the victim's identity and some other details (check out the preface). Part two allows you to take statements, perform an autopsy and ballistic examinations, and (try to) use the internal computer to gain information on police records and other loose related investigations. Then consult the

evidence and make the arrest. Simple.

My thoughts are as for Vera Cruz: really only the case details have changed. The same sense of genuine investigation exists, the joy of detecting leads hidden within statements is worth experiencing. However, when stuck, I'm still uncertain as to whether I'm on the right track but entering the wrong computer commands, or whether what I'm trying to do is irrelevant. I still feel more handiness is needed.

especially as few of us fully understand the French system of departments and regions, or their format for things like telephone numbers.

If you like Cruz, you'll like this. Most of the game — stick, unusual and a good puzzle.



GREAT



SCOTT ADAMS' SCOOPS Master Games \$9.99

Finally enough, only one of the games on this compilation is written solely by Scott Adams. One is written with a chap called Philip Case, another is co-written with his wife Ann, while the fourth is written entirely by her. Still, "Scott-And-Alison-Adams-with-Philip-Case Scoops" is a somewhat less engaging title, I guess. The unimportant thing is, all the games here are in that distinctive Scott Adams style: were come to know and love.

Some of you may never have played a Scott Adams game, in which case consider yourself lucky. Way back in the days of computing time (ie. during the

late seventies) he was one of the first people to release an adventure for a home computer (a TRS-80, or something similar). For this computer extremely limited capabilities, what he produced was remarkably good, so it sold well. Now moved on, better computers with greater memory allowed, the market changed — but Adams did not. He kept on churning out games which fitted into it, convincing them for the new computers as they arrived. His name being a veritable one, people bought his adventures, even though he was a dilettante who should have evolved or (perhaps better) Critics gave him good reviews out of respect for what he once was, though, if written by anyone else the games would have been ignored. Their only

redeeming factor was the quality of his puzzles — lengthy and ingenious. Unfortunately, the power was almost very limited, the text brief to the point of ridicule, the responses few and sloppy.

He would probably never have succeeded in the Spectrum market, except that his first games released on the Speccy were winning licensed names — *The Moll* and *Spiderman* — and that they were accompanied by some stunning graphics, at the time the best the Spectrum had witnessed.

But this US Gold compilation does not consist of those more attractive Adams productions. It contains four *WOTCH* adventures, previously unreleased on the spectrum (as far as I know). Three of these were originally written over the years ago, the fourth is based on a film no-one in this country has heard of (it's a torturing package, is it?).

The games are *Flute Adventure*, a beginner's game with self-explanatory maps, *Wotch Castle*, a supernatural quest to save a Colonel like *Strange Odyssey*, a space adventure which is now unplayably cracked, though it

would have been quite good when written, and *Backdoor Bored*. The last really is an oddity: the film is a very weird, apparently incomprehensible science fiction fantasy which completely flopped on its initial American release around two or three years ago and has never been seen here, though it has since developed a cult following in the States. Even stranger is the game, which is in the typical cut Adams' style, and is completely meaningless and pointless if you haven't seen the film. Which, of course, you cannot have done. I managed to find out a little about *Backdoor Bored* from a cinema magazine I read, but US Gold's usually worthless instructions tell you just this: "Only by unravelling the many puzzles set by Scott Adams do you stand any chance of completing this futuristic adventure." (What John Cleese would call a bleedin' obvious statement. How else do you complete an adventure? By spreading a cheese sandwich over the keyboard?) Set in the world of pop groups and science fiction. Very informative.

On the Spectrum, Scott Adams without graphics is like a radio version of a Charlie Chaplin silent film. The text is no

compensation. Here is an example of Wotch Castle at its most descriptive: "I am in a room in the castle. Wotch ferns. A big wall."

The vocabulary does not even include *Wall* as I thought the imbecilically inept instructions claim that it does!

Having read all this, you may be wondering why the game is not getting the lowest possible ZX rating (a *Grunt*). Well, considering there are four games on a £10 tape, they work out as budget titles — £2.50 each. As such they are not entirely bad. The puzzles are fun to solve, and the lack of distracting features (like text, graphics, a decent power or a noticeable number of locations) tends to concentrate the mind so for some good problem solving — I realize there are people who like Scott Adams' style of games even if don't understand why — this might be worth buying, but anyone else — steer clear! This is advertising of its worst.



GRIM

HELPLINE

This month's helpline is mostly devoted to two games about which I constantly receive a lot of mail. It seems appropriate to begin with the greater of the two. *The Kings Game I*. As I said in this month's introduction, I never had the patience, nor the time, to complete this. As a result, a number of helpline requests on it have been piling up in a corner of the dungeon. I'll now attempt to answer them, by giving a solution (and to me by Rockstar's master-adventurer, John Wilson. WARNING: these solutions are explicit, step by step guides).

Charles Jones is trying to complete the quest set by the Monk near Bodogast in the first part. When he asks the lady, go N, W, N, N, S to find the Great Knight. Attack and defeat him, and take the broken meditation that he leaves behind. Now restore your steps to the Monk, then go N, E, S to the red Lady, who you must kill, and whose meditation should also be collected. The Monk will now allow you to pass through the stone door, to the south of him, which opens to reveal another door. KNOCKS, WAIT and

Bodogast will appear. He will give you the magic words which restore the powers of the pole green jewels, and will enable you to pass the Great Knight. Of course, you could just avoid them.

Solving the riddles of Morio is our next task, set by Andrew McWater. Having said "Hearst" and entered, and having attacked the limboles, go east. Now that you're in the riddles, go up, east three times, down twice, west three times, down once and you should be in a corridor. PUSH ROBE and the slab will open. Go east three times, up and east into a room. EXAMINE and READ the things you find here. WAIT for Oria to appear, touch him. E, WAIT and Goodall will chat to you. I and UORH CANDLE WITH MATCH DOWN twice, S, D, S to the square room. Make sure your party is with you if not, bodogast is coming there. Now S, D and proceed. I until you reach the bridge. Something thrilling happens! When told to live, challenge and you'll emerge in a dale. This is only a basic route through; there is more to do if you want to.

Help in the Loff-Harten area, for A. Jodder, and Nicolas Chapt from Portugal (ZX is read worldwide). Having arrived at

the eastern bank on the Rhinodan, on off will enter WAIT, then proceed east to the bar. Here, the best policy is to SAY TO GO, HELP, and to SAY TO GO. "DO WA" (since they don't get on). When the bar is gone, you must go SE, then the sign, and WAIT SE, WAIT again. When the door has opened, head E to the tree, then UP and SAY TO GALADRIEL, HELP.

Questprobe

On to Questprobe 3. Very few people have solved it, not local because many of the copies seem to be bugged. I am indebted to Malcolm Horden who has sent me a complete solution. I have not been able to check it fully — my copy is a pre-production one, so probably is even less working order than the real — but I'm sure it's all correct. Horden has wrote to move Bob. This should be done towards the end of the game, you need the crown from the circus tent, and the purplewren from Laverna. Outside the castle, do thing that have taken someone (not to create that name). LOAD CANNON, GO CANNON. Switch to Horden (and not ARM CANNON AT BOB. FLAME ON HIGH, LIGHT FIRE. It begins to burn. BLOW FLAME AT

BOB — he will dodge to avoid it while thing will be fixed into the wall he was blocking.

Nicolee Claus has managed to gain access to the tunnel for thing, but it now stuck from the wall of fire where you light the candle, go W, S, S, S, S, you'll find a place where air is sucked in — represented in the astonishingly verbose Adams style by the word "Woooooo" SWITCH to the left, fly up to the new FLAME ON HOLD, wait for a bit, then THROW HIGH FLAME AT BOLLER. This stops off a pebble, EXAMINE BOLLER, and, together with the re-appearance of the "Woooooo" noise, it would seem, last is at the top of the shot: we left thing under FISH PEBBLE UNDER BOLLER, SWITCH and WAIT until it appears at thing's end. Then he can THROW FISH HAMP UP At Malcolm says, NOT the most obvious of sentence constructions. This should also help Andrew Bennett.

Malcolm Beer is also trying to dash in the coach in Dracula (check four scenarios, obviously) LOOK MURDER and you'll find a door LEFT SLAT, EXAMINE DOOR — locked! At REMOVED CROSS, BARRY CROSS and TURN CROSS, an improvised key you see OPEN DOOR, LOOK and you'll find some bones. Steven Woods needs to spike the dark brick wall in the third part of the same spreadsheet. If you head it then S again the bricked up gate, and LOOK ALKOPH, you will discover a tree, CLIMB it to see what's on the other side — too big a jump, however. So CUT TREE with the axe you found in the small hut (by smashing the window) now if you climb tree, you will be on the top of the wall, head west twice, then north, and LOOK AROUND for a means to reach the ground. A little hint though — once you cut down the tree find someone who wants the axe. They will be most helpful in return.

Finally, brief aid for Gordon Wright with The Vera Cruz Affair to examine writing, enter GRAPHOLOGICAL on an examination. You should find any information on Georges Lema.

Summertime Blues

The days are reaching their longest, the sun shines bright, the breeches beckon, and the sound of meowing hay leaves sufficient till the day has run its course. It is getting into full swing. And as you sit there enjoying it? "No!" you cry, why not? "Because," you scream in anguish, "we're hunched over our computers and won't leave until we solve this disgusting adventure game. We're cursed at the end — but we just can't get the precise wording."

Now now, leave the flickering screen and go get some sunbake, soak in your toes and skin cancer. Let me do the writing, let me be the pole, one, let me solve your adventuring problems.

Fill in the coupon printed here, read the small print below, then post it to Mindplay, No. 1 Graham Square, London NW1 1AA, and before you can say "Farewell What a scorch!" or "Margaret was wrong AGAIN!" you will know the answer.

British correspondents, please enclose a stamped, addressed envelope if you want a personal reply rather than wait some months for the magazine to come out. If you are writing from abroad, just enclose an envelope — I'll add the postage. I try to respond within two months (but I can take longer on the other hand, you might receive an immediate replay). I ONLY DEAL WITH ADVENTURES. Not arcade games, not technical problems (write to Crosswise about those), nor arcade adventures (Morpheus games included, not even Helix on The Magic!) Please put the name of the game you're writing about on the back of the envelope. And PLEASE don't write letters asking for general solutions — I just don't have the time to write these out for everyone. (They can be obtained, however, from clubs like Adventure Probe — write to me for details.)

Enjoy your June, and if you see an ice cream van, buy a Pler for me too!



Title	_____
Company	_____
Problem	_____
I can help solve	_____
Name	_____
Address	_____

Shadows Of Mordor

Another big adventure release this month, Lord of The Rings, part II.



THE SHADOWS OF MORDOR
Melbourne House
£7.95

The good news: *Shadows of Mordor* is a vast improvement on *Lord of the Rings Game 1*. The bad news: it is still not as good as it should be.

The game follows the story of the second book in the *Rings* trilogy, *The Two Towers* (so why wasn't it called that?) and is the continued quest of the hobbit Frodo, and his inland Sam, to dispose of a magic ring before the evil Sauron gets his hands on it, or rather his evil finger through it.

Screen presentation looks terrific — the same style as game one except those "margins" which housed the briefing notes have disappeared, so, thankfully, have the clodgy thumbnails. In fact the game is text only though on a peculiar basis, the briefs comprise what amounts to a middle-earth travel brochure, many scenes from the game are illustrated in a first-class gallery though some of these views are highly attractive and it's a shame they were not included in the main game (apparently they will be on the UK version).

The descriptive text is sadly listless and mechanical, a typical example being "Frodo is on a cold, windswept ridge in a

range of dry hills". Not really an advance on *The Hobbit*, is it? The text is made to look long by filling, in a clinical manner, who is there, what those people are carrying, and any objects (these are always referred to with a couple of adjectives, as in "the heavy round rock"). The text has no variety, no passion — and so lacks atmosphere, surely a vital component of Tolkien's work.

Then we have the parser, the performance of which Melbourne House expects should amount to, it's true that you can do some clever things, however when the parser does not understand one of the words in the input, it refuses to do any of it. This means if you type in a

string of commands, the last of which is not understood, none of them are performed. It also means you cannot simulate natural conversation, for example saying SAM "GIVE THE RING TO THE PLAIN", because words like PLAIN are not understood. In most games, the action would be performed anyway: the parser here is too clever for its own good.

The vocabulary is large, but with some curious omissions. Character interaction is bound to be limited if the game does not understand any question words. And you are occasionally expected to enter two obscure combinations, such as POLAR EAST (a clue).

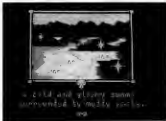
The most endearing feature of *Shadows of Mordor* is its problems, which involve complex object manipulation. I especially liked the lack of fixed solutions — there are often alternatives. For example, to descend the cliff at the start, the best way is to use some rocks, but I devised a way whereby Sam would upgrade a tree, and I would go down the hole this created. This method works, though unfortunately it also equates Sam to the spottiest. Few other games would allow you to vary and experiment in that way — very commendable.

So, *Shadows of Mordor* is cheap, sophisticated and fun to play. However, I strongly feel it does not do Tolkien's work justice. I can't help thinking that someone like Unai? could produce an equally sophisticated and far more friendly program, with more to do, and much more atmosphere and subtlety. Only a program like that would truly capture the magic of the *Lord of the Rings*.

Peter Saunders



GREAT





INDOOR SPORTS

A quartet of indoor games from Advance.

**Indoor Sports
Advance
£2.95**

■ Our games for the price of one is the eighth in terms of this unusual compilation of indoor sports. You can hang up your skis and running shoes for the time as they are indoor games that everyone must have played at some time in the past.

The gameplay contains a main program that includes a menu from which you can load in the four events. Although they can be played in any order it's best to tackle in the order they appear on the tape.

As hockey is without doubt my favourite game, I've spent many an hour in the gloves smashing my knuckles in an attempt to drive the puck into my opponent's goal. In the real game the puck is supported by a cushion of air and can reach some incredible speeds when it can slip off the table and hit some unsuspecting space invader. The computer version of this doesn't have that important feature, but it does offer four computer opponents, three game speeds and the smoothest graphics you are ever likely to see.

Darts has never been done well on a computer and this isn't an exception. The event consists of two screens, one to aim the dart and keep score and the other is a graphic view of the player throwing the dart. The first screen is the business end of the game and it's where the player decides

the direction, angle and strength of each shot. After the throw which is shown on the other screen the computer checks off your score and the game continues until either one player gets the double to finish a 301, 501 or 391 game or a player runs out of time that ticks away at the bottom of the screen. This version of darts is timed to prevent slow play!

Table tennis has never been a great skill of mine but now you can play, get hammered but without the embarrassment.

You can play either a single match or a series up to the best of seven matches. The games can be played at beginner, normal (real) or hyperdrive (very fast) speeds so it's wise to opt for the additional auto move option that automatically moves your bat to meet the ball leaving you a lifetime the shot. Take on too much straight away and you'll certainly get beaten by a ruthless opponent.

An additional feature allows you to bias a match by assigning between 1 and 20 skill points to each player and can be distributed between smothering, lashed, backhand, reactions, speed and endurance factors that affect the movement and skill of the ghost like bat that hovers above the table.

As with all the events the attention to detail is extraordinary, particularly the subtle difference in shading of the ball's shadow that makes it look like a reflection in the polished table top.

The fourth and final event will leave you skilled as the ten pin bowling is probably the hardest game to learn and master.

The game begins with a side view of our bowler competing against human or four level computer opponent as he

begins his run up. By selecting joystick positions you can stand him anywhere in the lane and select the general direction you want the ball to go in. The Holy Grail is timing a final joystick press as he swings the ball to release it, as if you press it too soon it will drop on his foot for a foul too late, and he'll follow it down the alley as he takes a bowlegged

To add to your problems you can play curve the ball into the ditches if you know what you're doing but it's more likely it'll end up in the gutter.

The score now shifts to a head-on view of the ditches as the ball comes down towards them. Above the lane is an added comic touch as the game mimics your facial expression as the ball either strikes the lot for a strike or falls unceremoniously into the gutter.

The game then switches back to the side screen as a pin rises in the score of the bottom of the screen.

Unfortunately the ten pin bowling does have one minor bug — you don't get the extra pins you should if you score a strike or spare with your final ball. Ten pin bowlers should find compensation in the three other games for this omission — others won't even notice. Despite this, the bowling compares well with US Gold's Ten Pins that was certainly too realistic and included all the lengthy delays in the real game as the pins are reset by the machinel. With Indoor Sports you get straight into the action.





Key words: aging; cognition; memory; personality

Programs will give you the basic elements of the routines used on Fig. 1 shows the layout reproduced on a character-by-character basis. Changing some of the routines will alter the position of the clock, strength bar etc. and persons icon. If you want them to all be replaced by standard PMS-AI positions then you may then turn off the subroutines. Less simple are the routines to generate code routines, so it's need to check these out in more detail.

1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 26

This is a set of ten character resources wide to change the way you need to POKK 00001 and 00002 with the new width, and 00003 with the new value + 1. The vertical bar printed by LSC0001 is of graphic blocks. To change the character you could design a uddi. POKK the character code into 00001. It also defaults to black PK if you want a different colour to match, say, a false border. Include LSK (1) at the start of Program-4, where L = LSK colour. You can also increase the caption area by POKK 00003 with the height. This may also need to make alterations in the number of lines allowed in the text editor. Don't forget to lengthen the bar printed by LSC0001. POKK 00003 with the new value, if you're not using black ink on yellow paper, you'd also have to POKK your attribute value into 00000 and 00001.

As with the quilting process, a fabricator picture — **ink and paper** — if you want to introduce more colour or other attributes you can do this using a fibre, such as:

POINT AT row column, OVER 1:
INCAPTIONEDCAPTION number;
"Special reply to the number of
characters who wish to attend"

after the Program 4 routine has finished, so in the first screen dump shown with the tool, you could make the matrix symbols over the open door look bright blue ink on yellow paper with

FRONT AT 1. MS. OVER 1. INT 1.
BRIGHT 1. PAPER & FLASH 1. TO
WOODCHOP

You would save bytes by having your opening screen layout load in as a SCRIPTS. If you did this you could have a whole screen-width picture to begin, changing to the standard 160-character wide with the first word.

Abstract

This is set to 30 columns wide by five rows high, with top left corner of row 0, column 0. To enter the number of rows ROW:

START with the new value = 1
and add it to the new 5 Full
start address. Use Table E to find
this.

Continuity was also evident in the 1990s, although the number of people who had been in the army for 20 years or more had fallen to 10,000, and the number of people who had been in the army for 30 years or more had fallen to 5,000.

involve drastic changes to the code. On your own, find out if

Well, that's **STP** complete.
Now engage (with **STP**) and go
back.

Figure 1

1997年，在《中国环境报》上，曾刊登过一则关于“中国环境报”的报道，其中提到：“中国环境报”是“中国环境报”的“中国环境报”。

1000

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[illegible][illegible]

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	Address	low	high
x = 12		129	72
13		161	72
14		193	72
15		225	72
16		1	80
17		33	80
18		65	80
19		97	80
20		129	80

WORLD GAMES

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\$9.99

U.S. Gold go around the world in search of bizarre sporting events

Just when you thought it was safe to pick up a joystick, eight new sporting events appear to challenge you in a round the world compilation.

Russia is the first stop and a chance to challenge the champions of the lion game of their own sport. Two different weight lifting events are ready to test your skills, the snatch and the clean and jerk. Up and down joystick movements need to be timed well to complete the lifting movements to ensure that you don't collapse in a heap and get the white lights from the judges.

In competition the key is deciding when to increase the weights (shown on screen as the

dumbbells get bigger) to knock out your opponents without straining yourself.

After a quick flight to Germany it's time to take part in a 300 year old sport, barrel jumping. The contestants have three attempts to keep the highest number barrels lined up on the ice rink.

Synchronized joystick waggling is the hint for this event to get as much speed as possible so you clear the barrels in time for a good landing. Get it wrong and you'll hurt more than your pride.

Flying off the way to Mexico just to flail yourself off a cliff may sound over the top but it's because cliff diving is the next event in these global games.

In ladders test your nerve and your skill as you plummet into the depths of the sea below. If you mismeasure your leap you could inspire yourself on the rocks below. To impress the judges in your three attempts and take the gold you need to dice with danger and dice with style.

The next event is another downhill plummet only this time it's a sleds down the ski slopes of France.

A course fraught with peril and cluttered with gates to be negotiated really tests your skill. Miss too many gates and the gravity here will put you out of competition. But if you hit a gate head on or the side of the course you'll be wiped out.

Next stop is Canada and a river of river log sailing in which you must wait the log so that you're opponent takes the plunge. You must time your joystick moves to keep in step while understanding your opponent. Whoever loses his balance first becomes dinner for the sharks. Last of these decides the contest.

Further south in America Ferdinand, Simon, Leo and Tomado await your arrival. They're bulls that you have to ride in a rodeo. The bulls will try to buck, spin and stop to try and unseat you. You have to counter its moves to stay on or else as you can.

No global games would be complete without a trip to the heathier of Scotland and a chance to test the golfer.

Timed left and right joystick movements will start your run after a quick flip to the boggyholes (and then you must hit the collar as the log flies over one complete turn (and doesn't land on your head or your feet) this is probably the hardest event to master and the most painful to watch.

The final stop in our eight event and 24,000 mile trip is the battle of the Subbler as two sumo-wrestling bunnies to shove each other out of the ring.

As the two 400 pound warriors use each other up you have a chance to revive the robots to push, wig and grab your opponent. If executed correctly you could manage a spectacular throw and another gold medal.

World Games is the latest in the series of adventures of boys games that includes Summer Games II and Winter Games. This Spectrum version has been coded by Irish programmers, Choice (who were responsible for the superb Hardball) and have added quality to the graphics and animation that was missing from the others. If you're a joystick athlete you can't afford to miss this one.



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MICRO FARE

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Head

John Bliman doesn't like his newspapers. The first thing I noticed when I arrived on the doorstep of his home in Hendon was a sign saying 'No free newspapers'.

Fortunately, he seemed to be a bit fonder of computer mags, which is why I was there to meet the man behind a string of software hits including games such as 3D Combat Zone, Match Day, Batman, and his latest, Mötley Hi!, Head Over Heels.

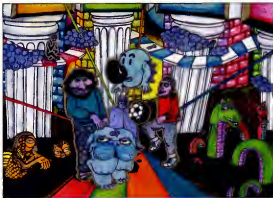
When I arrived John was experimenting with the sound chip on his ("well dodgy") 128, chattering a tape of the 128's through the computer, digitising the music and playing it back through the sound chip via his television speaker. The result was some of the best sound I've ever heard coming out of a Spectrum, but don't expect to hear many symphonies coming out of your machine in the near future. Because storing that sort of sound gobbles up memory at

the rate of 10K a second... whilst on the subject of sound, John mentioned something that wasn't obvious from looking at the instructions for Head Over Heels, which is that if you've got a 128 machine you can load the game in 128 mode and get extra tunes and sound effects that aren't present in 48K mode.

John was joined by his graphics designer, Bernie Drummond, and we started to chat about the new game which, in its early stages was called Foot and Mouth.

"We were a bit worried that the reaction would be 'Batman man!', John told me. "But Head Over Heels was a logical progression from Batman. When I finish a game I think I can do a lot better, and the graphics are better because Bernie's learnt a bit since then." Bernie agreed and, pointing at a screen dump of one of the Batman screens, said that he studied when he looks at it now. Despite the

What do Radle Rentals, Foot and Mouth and Batman have in common? Answer: John Bliman, author of the hit game Head Over Heels.





Programmer

similarities between the two games Head Over Heels is clearly an advance over Batman, with cleaner graphics, more movie rooms, and the added complexities of controlling two characters rather than just one.

I had assumed that the Batman games were commissioned by DC as part of their never-ending quest for licensing deals, but it turns out that Batman was their idea. John had seen Knight Law and was "highly impressed," and thought he'd like to produce something like it. According to him, the Batman contribution was just a hook.

Hooked up

"The thing was, how to avoid the trap of Knight Law and being labeled an ill-fated clone. So we thought of a hook that had importance of its own." And once they'd decided on Batman, DC had handled the licensing agreement. It seems that John was working for DC then. He says they're very efficient and have much higher sales than most software houses. For most companies a game that sells 10,000 copies is a success, but Batman sold 11,000 in just the two months leading up to Christmas '85 and that was six months after the game was first released. Total sales of Batman are approaching \$2,000 while his earlier game, March Day (written with Chris Clapper) had topped the 100,000 mark.

So, how did John get started on the stuff that led to Head Over Heels?

"I worked as a TV field engineer for Radio Rentals. They were doing trials on Atari machines to see if they were worth renting, so I thought I would be worth knowing something about them."

Like so many programmers, John bought a 2081 when it was first produced in 1982, and his first game, Worm Borders came out on the Atari label just four months later.

"I bought a Sinclair games type and it was great. I thought 'I've got to be able to do better than that!' And so I gave John a Spectrum and he produced three more games for them before moving to Ocean. A couple of years later came the encounter with Knight Law.

"I've got a lot of respect for Ultimate. I don't think they're brilliant programmers but they are good games designers. They invented the 3D format and when I saw it I thought - How I wish I'd done it."

"When I looked at Knight Law I didn't have a clue how they were doing it but I invented my own way of doing it."

And, if anything, John seemed far impressed on the original. He claims that his techniques for playing disks are more efficient than he's seen in any other programs and it is this which allows him to make Head Over Heels so complex. The game has 300 rooms in it, yet the data to describe all these rooms with their traps and obstacles occupies just 2K, the average room takes up seventeen bytes, while the smallest rooms are a mere seven. It makes the mind boggle to think what he could do using the full 128K memory of the Plus 2, or even the last aspects of the planned disc-based Plus 3.

The rest of the game consists of 2K for sound effects, 16-17K of graphics data, and about 20K of data to control the "morphology" of the game. John says that he spends a lot of time just working on the basic morphologies of the game, and that the fine details such as the layout of the individual rooms can be added in a relatively short period of time towards the end of the process. When he was writing Batman, John spent three months working on the environment that the game is set within before he even saw anything on the screen.

Once he's got the basics of the game worked out John then tries to make roughly what he wants and how much space he's got on screen for the graphics, and then goes off and works on some ideas. After that they work more or less side by side exchanging ideas and making adjustments as they go along.

John likes to put together thinking problems and combine these with a practical problem, so that not only do you have to logically work out the solution to a particular task (such as reaching one of the four corners on Head Over Heels) you also have the added task of manipulating the objects around you in order to physically put your ideas into action. Sometimes you

can see what you want to do but you don't quite work out how to do it. It's this two-sided approach to the gameplay that makes Head Over Heels so horribly addictive.

"You have to envisage how the game is going to play. I see this you have to get the gameplay right in order to make sure you've got something worth playing. Some programmers spend so much time trying to produce a work of technical genius that they lose sight of the gameplay."

Future fixtures

John and Beattie next project is to help out Mickey Don co-writing Chris Clapper with a disc-based, highly realistic football game designed for up to three players. And this will probably be followed by March Day 2, a briefly new version that will be designed from scratch. Then, moving a bit further into the future, John is thinking about returning to the 3D format with a game that will mark out as you go along, eliminating the need for rooms of rooms to draw maps on. Being a fan of Dungeons and Dragons he says that he would also like to produce a two-player game in the 3D format, in which the two players can hook it up on screen just as they would in a game of D&D.

I asked John what he does for entertainment apart from playing D&D. Does he play other people's games or avoid computers altogether?

"I program for entertainment!" Both John and Beattie get up late, stay up late and work more or less when they feel like it. "I don't work office hours of all I tend to work 11 am to 4 pm or 11 pm to 4 am. It's a nice life."

Games by John Beattie

- 1982 Hawk's Luck (2081, Argus releases)
- 1983 Worm Borders, 30 Combat Zone, Demotape Computers
- 1984 Worm
- 1984 Marchday with Chris Clapper
- 1985 Batman with Radio Rentals
- 1987 Head Over Heels with Radio Rentals, then And in with Chris Clapper & Radio Rentals

Motorcycle mayhem in
Activision's dirt track
hit.

Enduro Racer
Activision
£9.75

ENDURO RACER



Enduro Racer is quite simply the best motorcycle racing game I have ever played and is destined to follow in the tracks of *Countdown* and *Commodore* as a outstanding coin-op conversion.

The game is a race against other bikes and against the clock as you've got 60 seconds to complete the circuit.

You're moving through the pits slowly as you hit the first bend, then suddenly you notice a pile of rocks across the whole road! Almost without thinking you pull the bike back into a wheelie to leap the barrier and roll over to land safely on the track having just missed a tree and bike busting pile of boulders.

More bends, hills, boulders, trees and jumps lie in your way as the track flows ahead of you in startlingly clear graphics. As our hero negotiates a tight bend he puts his leg out to steady the

bike and if he comes a cropper the crash is almost painful to watch.

If he runs out of time before he's completed the circuit the game ends with a percentage score showing how much of the course you've navigated, which drives you back to another game especially if you've just reared off by a narrow margin.

Should you succeed then you've no time to celebrate, not even for a top of honour as you're literally thrown into the second of the five courses. This time the action's set in a desert with dust clouds swirling from your back wheel as your tear around the course.

In the first race the bikes don't like to get in your way but this time you'll have to avoid (and even try to miss) you down as well as those jumps, fallen trees in the middle of the road and massive boulders that almost block the road entirely!

To add to your problems you have only 30 seconds added to your time left from the first course in which to go the distance and qualify for the next three races.

The gameplay is quite superb with the joystick or directional keyboard controlled bike responding immediately to your control but the real test comes when you land after a jump, hit a bend and have to steer through three bikes to get into position for the next jump. The only way to do this is to feel your way through. In a game that's so realistic you'll almost need a crash helmet!



THE DISCOVERY COLUMN

More advice and
readers' tips, presented
by John Wase.



For some time now I have had random access file programs floating in my head. I usually write a lot of code for a month. Rusty, a program from Andrew Bailey of Bradford which sets up a random disk address system (don't I hear you cry) but with a difference: each segment is on a separate random access file. It's a very long program, but I hope to include it in a future issue. We do have problems with long programs; please do try and keep them reasonably short if possible. One solution is to include a program segment, and this is what I propose to do with the second item, a listing from Brian Clough of East Kilbride. At last we have some novel programs coming up, for Brian searches random access files with this binary search routine:

Don't try and RUN this program. If you don't it is merely a version of a 17K program and a characterless history which principles rather nicely left us with the 17K program. It's a Root Forecasting Program which supports a number of random process files. These include a history file (1237 records, each of 85 characters) (04 + "HIST") 04 = tel team numbers 0-4 = 2nd team numbers 7-10, previous results of tel teams ground; H-04, previous results of second team ground). In addition to the history file, there is a team file (for random access) with the team names and numbers, and when the history array is set up, it is also saved as a random access file. The program will also shortly be expanded to include league table

the listing (figure 11), I expect rarely to search routine. If it, however, very well documented with HTML statements, and there should be no difficulty in following its operations. It searches for the history of past performance of each of the two teams in the current database. This contains the main reasons to

pretor is win, a loss or a draw from odds that this program was started only this year and to date he has one small win, so he gives no guarantee as to further method.

Introduction

Mr Goodman of Stoke-on-Trent sent me an interesting letter supplementing our recent article on "The better letter". He sent a list of 10 to offer the chosen character shapes for the Cyril version of *Times*—(2) letter **CYRIL SIGN**, and load the **Times**—(2) **sign**.

TASCOCARD (CODE: 28090) Put your disc carefully away! Use the four tie fasteners I gave you to hold it down in its protective plastic sleeve. Now if my modified code can't solve your problem with **SARS-7-TASCOCARD**, #68238, Mr. Bloomberg also writes that his has suffered my -2 problems (see my recent letter); he too complains of loss of control symptoms when the 43 is cold (although it's fine in SARS), and fine when it warms up. I wonder if this is a problem specific to the Opus power unit or the Opus forward version? Anyone out there got a suggestion yet in relation to this?

[illegible][illegible]

Fig. 4 Program is an Epson dump.

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1 REM COPY
2
3 CLEAR 51277
4 LOAD 4"e":||"HCOPY"CODE 52999,474
5
6 INPUT "SCREEN NAME "I$B
7 LOAD 4"e":||5$SCREEN$
8 RANDOMIZE USR 52529
9 RANDOMIZE USR 52999
10 OPEN 45:"B"
11
12 INPUT "TABULATION "I$B
13 FOR Y=0 TO 21
14 PRINT 45:CHR$(27)"B";
15 PRINT 45:CHR$(27)"B":CHR$(tab):CHR$(B:CHR$(Y);
16 PRINT 45:CHR$(27)"B":CHR$(1);
17 PRINT 45:CHR$(27)"B":CHR$(B:CHR$(1);
18 FOR X=0 TO 255
19 PRINT 45:CHR$(1)PEEK (52999+Y*256+X);
20 NEXT X
21 PRINT 45:CHR$(27)"J":CHR$(24);
22 NEXT Y
23 PRINT 45:CHR$(27)"B";
24 CLOSE 45

```



Fig. 4 Sample Diskette screen dump.

copies in about 2 minutes, but I couldn't test it: my wife has a Shetland, but I saw me coming and went on strike. I got also told if anyone knows how to export a diskette with only one answer — 50 error. My own feeling is that since it's having trouble reading even the catalogue file, then either this has been totally corrupted or the sector markers have been lost. If it is entirely the catalogue that has been corrupted, then you might win with the "help block" facility in Brocade Software's Disk Manager which allows you to read in any block from the diskette a buffer size in the Spectrum, modify it, and save it on another disk.

Epson dump

Next, Patrick Mackinlay of Lucton Oling, tells us how to dump a machine code dump — this

time for an Epson (Figure 7). It is stored in the printer buffer, so we don't need to CLASH anything,

Fig. 7 Epson dump.

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Depending on your point of view, this is either a six pack compilation with one free game or a seven game compilation. The seventh game in question is Quik and presumably Mr Fox (like under another name) are calling it a free game by virtue of the fact that it's not been previously released. Either way this is still a good value for money collection, aimed primarily at the decade end of the market.

The first game on side one of the tape is a much typed *Scouty 500*. When this was announced there was a lot of talk about how marvellous it was going to be, then it seemed to be dropped because the programmers couldn't fit the game into just 48K. Then what it did appear it vanished almost without trace. That was inevitable I suppose, because after all that's the end result was an amusing and mildly addictive game with some nice graphics, but it wasn't anything particularly special.

Joining *Scouty* to the task of rescuing *Scouty* and Co. from the clutches of the mad scientist, you can move on to 1942. Bitter contention of the coin-op game in which you have to fight your way through waves of enemy fighters to reach safely on an aircraft carrier in the Pacific. The game did look a bit odd but it was cancelled by the time it reached the Spectrum, but it's a nice simple shoot 'em up the sort that's always good for while away a few spare minutes.

Next on the tape is *Quik* which turns out to be a *Scouty* variant, but dressed up in modern soldier gear rather than *Scouty*'s whimsical warlike trappings. Like *Scouty* it offers a two player option which is much more fun than playing on your own. It's quite good fun, but the *Scouty* similarities are so obvious that I can understand why there was no point in releasing it after the initial flurry of *Scouty* clones had been and gone.

Same number four is *Jet Jet Willy* it's the expanded version of the original *Jet Set Willy* game. It's possible that there's a whole generation of relatively new Spectrum owners who have never seen or played *JSW* or its forerunner predecessor, *Willy Mine*. However *JSW* still holds its

THE HIT PACK



Left personalities

place as the ultimate platform game. Subsequent happened to Matthew Smith.

Side two gets off to a good start with *Police Officers*, *Secret Armour* or *Antik*. I'm surprised to see this on a compilation so soon, and I wonder how well it sold as its first release.

Antik is an animated graphic adventure in which you have to guide the warrior Kot through a ruined city and into the heart of a volcano to destroy a nuclear generator. Along the way you have to collect the components that activate the suit of armour which will protect you from the radiation collapse and the robotic guards that you'll encounter. The graphics are excellent and the gameplay is well thought out, and I'd probably pick this as being the best game on the tape.

Melbourne House Fighting Warrior followed the success of *Expanding Fox*, and while it wasn't quite as addictive as *Fox*, it's still as good as most of the other martial arts games that tried to copy it, and which are still being churned out even now.

Rounding the tape off is *Left Hand*, *Right Hand*, *Down* and *Up*. It's a square puzzle based on a very simple and

very old type of puzzle. *Down's* computer version managed to be surprisingly enjoyable to play and stands as one of their better efforts.

Apart from *Antik* none of these games are really outstanding, but unlike a lot of compilations which include just a couple of good games and are padded out with a few complete flops, all the games on this six for seven pack are good solid arcade entertainment and the combination of all of them together makes this one of the best value arcade compilations I've seen for a while.



MONSTER HIT

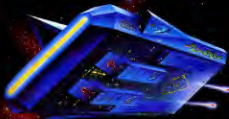
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